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Battelle Technical Review

IN THIS ISSUE:

Reliability Engineering Today and Tomorrow

VIGNETTE

CHEMICAL ENGINEER

JOHN W. CLEGG

The twentieth century has seen a revolution in the types of materials used in manufacturing. We have shifted from what might be called raw materials to dependence primarily upon synthetic or highly-refined materials. Chemistry has been largely the prime mover in this change. But John W. Clegg, manager of Battelle's department of chemical engineering, points out that the chemical engineer has had a key role in making the revolution possible. His widening knowledge and expanding skills have enabled many advances—among them have been development of high-energy fuels, the newer metals, automated processes, and applications of nuclear energy.

In his years at Battelle, John has had a hand in many of these changes. He has been involved in various phases of atomic energy research—beneficiation of uranium and thorium; extraction of those metals from ores (the anion-exchange process was developed at Battelle); development of reactor shielding materials; and the study of radiation processing of materials. He and his colleagues have been responsible for much research on metals; this extends from processing of ores to production of unusual, high temperature, and high purity metals. Among the latter have been titanium, zirconium, columbium, chromium, and tungsten. John also has participated in the development of chemical products and intermediates, ranging from esters to hydrazine. Under his direction, processes have been developed for producing fertilizers, hydrocarbons, tar acids and bases, sponge iron, and tipped nylon fibers for brushes, among others.

In addition, John and his colleagues also participate in technico-economic studies and data-assembling tasks which often lead to publication. One such is the widely used *Liquid-Propellant Handbook*. John, himself, is co-editor of the recently issued Geneva Presentation Volume *Uranium Ore Processing*, and a score of articles and papers also bear his name.

John participates actively in professional society affairs. At the recent Annual Meeting of the American Institute of Chemical Engineers, he was installed as Chairman of its Nuclear Engineering Division. He is also chairman-elect of the Central Ohio Section of the American Chemical Society. During the past year he served on the Program Committee for the Engineers Joint Council's 1958 Nuclear Congress. His professional society activity also includes membership in the American Institute of Mining, Metallurgical and Petroleum Engineers.

Before coming to Battelle in 1944, John had served in du Pont's Nylon Research Section. This association followed the completion of his work for a Ph.D. degree in chemical engineering at the University of Minnesota. Earlier he had received his B.S. in the same field from Georgia Tech.

At home, along with his wife Doris, John enjoys the activities of their eight-year-old daughter and two younger sons. Except for occasional forays at the bridge table, he keeps busy with projects at home.

BATTELLE TECHNICAL REVIEW

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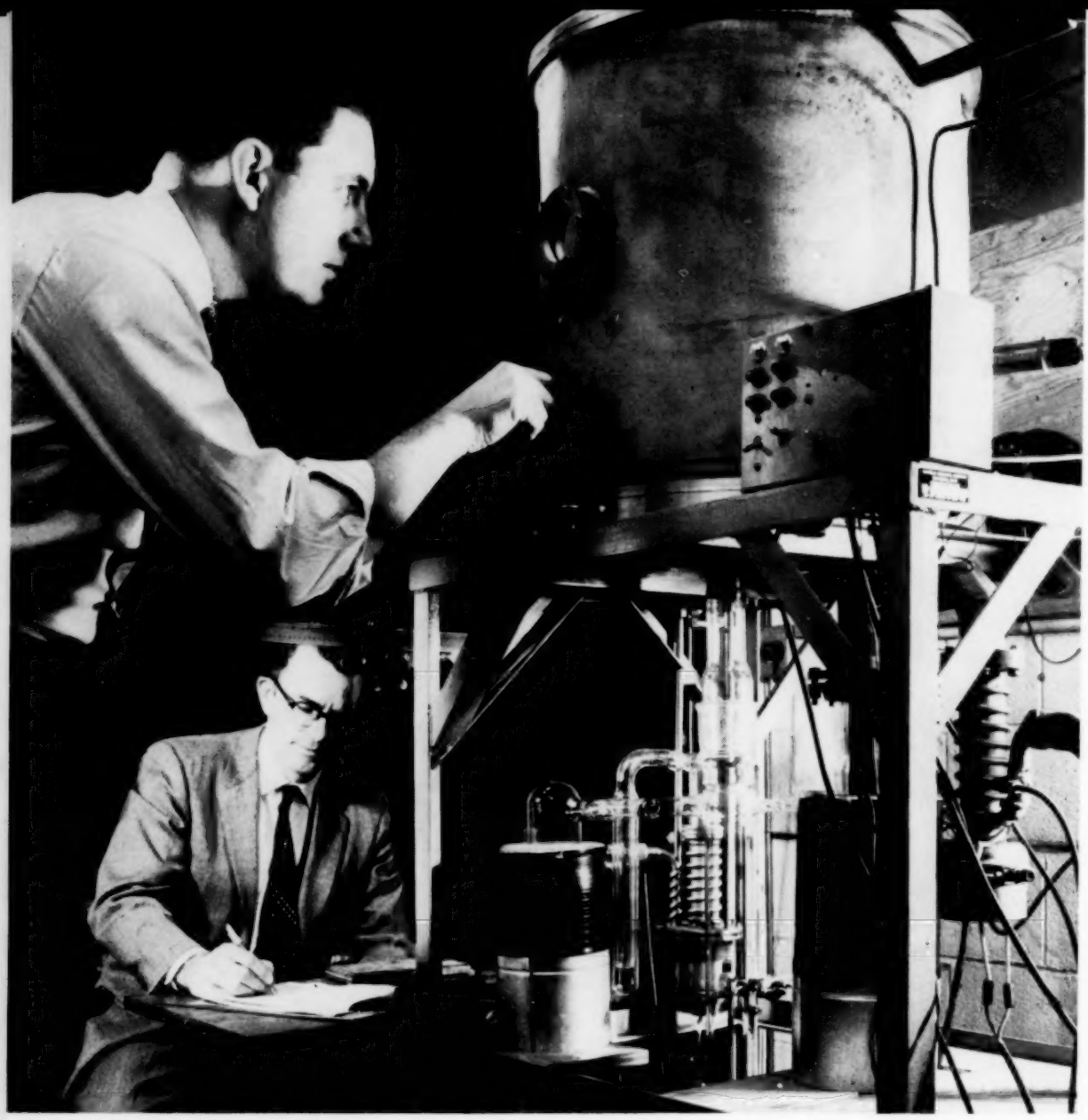


UNIQUE CELL ALLOWS SIMULTANEOUS MEASUREMENTS

The vapor pressure of a volatile form of copper nitrate and the average molecular weight of its volatile species is being determined at the same time in a unique Knudsen cell. The cell containing the sample (visible in the large vertical glass tube) is suspended, by means of a torsion fiber, from the arm of a balance in the large vacuum tank. While one man (peering into the vacuum chamber) determines the rate of vaporization, the other checks the device which measures pressure. Molecules escaping from holes on opposite sides of the cell tend to twist the suspension. The twisting force is measured by an electromagnetic device. The apparatus, which was designed by Battelle physical chemists Elton Hall (left) and John Blocher, speeds gathering of data and assures identical conditions for both the pressure and weight-loss determination.

Among scientists and engineers may be found many of the dedicated persons of this world. They seek to meet the high standards of their professions and to serve the best interests of mankind. Yet as with persons from all walks of life there is "self-interest". This, of course, has its effect on the individual's productivity. In this article is presented one man's opinions on an apparent paradox. It is, perhaps, his response in part to the article, "Wanted: A Personal Philosophy for Scientists", which appeared in the September, 1958, issue of this journal.

The Importance of Being Yourself

by William H. Browne

Personal selfishness is a characteristic of people in all modern societies. Many people believe that selfishness is the most powerful force behind individual contribution in a competitive environment. By its actions, society conditions the individual to compete with his fellowmen; to compete for money, power, and prestige. These it holds out to be "success", and thus the individual is motivated to strive for these rewards.

On the other hand, threaded through the culture of this same society is an opposite teaching—a ban on selfishness. As a child, the individual is told to deprecate selfishness, to deplore it. He is sometimes encouraged to oppose the selfish acts of others. Thus, there comes a time when he experiences guilt and anxiety as he views selfishness within himself. At the same time, however, the needs of everyday existence require that he put forth his best efforts to gain for himself and family the rewards of "success" in a competitive society.

This seeming contradiction confronts the individual with a paradox, a paradox that prevents him being himself until it is resolved for his life. Resolution is essential if he is to realize a full and satisfying life, a life with purpose beyond the acquisition of the necessities of physical existence in this world. In search of understanding, let us first consider how this paradox came about, how selfishness is both fostered and condemned.

The condemnation of selfishness finds expression in many writings. The theology of Calvin, for example, states, "We are not our own; therefore let us, as far as possible, forget ourselves and all things that are ours". Here, he was advancing his thoughts on the relationship between man and his Creator. Also, he was rebelling against his society's emphasis on man being significant in what he possessed. Against the perfectness of his Creator, Calvin taught, man is insignificant and ought not to be concerned with self or possessions, material or otherwise. Calvin's thoughts, along with many other thinkers of his time and later, have been extended into our day and society to mean that man should not feel interest, responsibility, or respect for himself. He should put aside

completely any interest in self and consider only the interests of others, of the group. To act in the "interest of self" is considered selfishness and selfishness is evil. Thus, self-interest and selfishness came to be considered synonymous to stand at one pole of our paradox. This synonymity has become a strong weapon against the free growth of personality, hence the growth of self. At the same time, the confusion increases the pressures of conformity.

At the other pole, selfishness, or its modern synonym, self-interest, stands as the prime mover for individual contribution. Even in feudal days, some land tenants were permitted to retain a portion of their produce as an incentive to produce more. The greater their efforts, the greater their reward. Today, this "spirit of competition" among men has developed to a fine state of perfection. For example, the president of one large corporation continually and publicly pits one vice-president against another, dangling before each the chair he will vacate when he retires. One result of this tactic is that each executive does his utmost to outdo the other. In other cases, the tactics are a bit more subtle. Thus, comparative production performances are used to foster competition between production plants or among the salesmen with the results affecting individual salaries and promotions. The admonition lying behind such tactics is, "Don't let the other fellow get ahead of you". Yet in many such situations, the end result is a competition which can destroy any vestige of organization, morale, or sense of personal accomplishment.

Considerations on Self-Interest

This leads us to several important questions: Is it possible that selfishness and self-interest are not synonymous, that self-interest can be served without being selfish? That selfishness *is* to be condemned while self-interest is to be advanced as the real, constructive drive of free individuals? That perhaps the interests which we consider self-interests are not the interests of the *real* self? That they are merely material rewards not satisfying to the inner self?

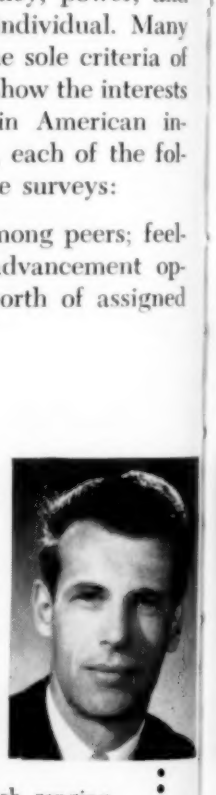
The first step in answering these questions lies in an agreement on a definition of selfishness. For our discussion, this characteristic is considered as deriving from an *undue* love of self. It is understood by most people that the selfish individual acts to advance his own ends without concern for the rights of others. He approaches every situation with the question, "What's in it for me?" He takes great pleasure in receiving, little in giving. All persons and all things are evaluated from the viewpoint of their usefulness to the selfish self. The selfish person is interested, therefore, solely and exclusively in himself.

Although selfishness is both frowned upon and smiled upon, and is subject to shades of definition, depending on the individual's life experiences, self-interest is subject to even greater ambiguity. To approach this subject of self-interest we must first recognize that the one person with whom the individual is continuously and closely associated throughout his life is himself. Erich Fromm puts it this way, "The entire life of an individual is relentlessly bound to the interests of his self". This self of which Fromm speaks is a unique human being with the same right to respect from the individual himself as every other human being. The individual, therefore, has a responsibility to his self as well as to others. The Biblical commandmant, "Love thy neighbor as thyself", attests to this dual responsibility. The basic question to be answered is: How is this responsibility to be discharged?

Society's Rewards as Values

As we have seen, society has money, power, and prestige to offer as rewards to the individual. Many people unthinkingly view these as the sole criteria of "success". Surveys have purported to show the interests or rewards wanted by employees in American industry. To a greater or lesser degree, each of the following appears in the results of these surveys:

Recognition by superiors; prestige among peers; feeling of belonging; salary; security; advancement opportunity; freedom of action; and worth of assigned responsibilities.



As an administrator of research, William H. Browne has a continuing interest in the study of the dynamics of personal relations and of the factors influencing individual accomplishment. From this interest stems appearances before Air Force and American Management Association groups where he has discussed facets of research administration. Manager of Battelle's department of mechanical engineering, the author guides departmental research ranging from aeronautics to applied mechanics. Author and patentee on mechanical engineering subjects, he has been elected to Sigma Xi, honorary science society, and is active in the work of the American Society for Mechanical Engineers.

These are the properties of the group, the society in which the individual lives and works. They are controlled by the group, not by the individual. They can be assembled roughly into the reward categories of society; i.e., money, power, prestige. The individual can set out to gain these elements of society's "success" or not gain them, as he chooses. To a large extent, the pressures of his responsibilities to his family are calculated to leave him little choice; he must provide the necessities of living, food, shelter, and clothing. If he has "ambition" he may go beyond these physical essentials; he may seek to "be somebody" in society by acquiring the additional rewards of society. He may seek these symbols of "success".

If the individual's actions are coarse or ruthless in the pursuit of these goals, society may seek to deny him its rewards. More often than not, however, the rewards will be forthcoming, and he will be considered a sharp or astute business man, a political leader, an outstanding attorney, a dominating personality to be admired or to be envied as an "operator". Let us assume for the moment, therefore, that the individual does acquire these material and public rewards with a frequency which is appalling. Yet he is likely to find that his goals remain unsatisfied, however great these rewards. He is driven by an inner compulsion to demand even more evidence of his value according to his own self-appraisal.

"Perhaps the most central idea in our whole American tradition is the belief in the inherent dignity and importance of the individual."

O. A. Ohmann

Is it not possible then that such men have been fooled or that they have permitted themselves to be fooled as to the real interests of self? This thought is clearly expressed by Ibsen in *Peer Gynt*. As Peer Gynt comes to the end of his life, a life directed to acquiring the "success" symbols of his society, he is told that he has amounted to nothing and that his self must be returned to the pot of raw material from which new lives are made. He then realizes that in his effort to gain the material rewards of his society, he has lost the success of his self—i.e., has lost his own life. At this point, he might have recalled the Biblical admonition, "For what is a man profited, if he shall gain the whole world, and lose his own soul?"

The Real Interest of the Self

Many writers in the fields of religion and psychology conclude that the interest of self, the *only* real interest of self, is the full development of the potentialities with which it was created. Spinoza, in the seventeenth century, stated this thought in a different way. "The more each person strives and is able to seek his profit, that is to say, to preserve his being, the more virtue does he possess; on the other hand, insofar as each person neglects his own profit he is impotent." Here Spinoza's "preserve his being" meant the realization or attainment of all the self can be. Just as a talent becomes lost if it is not used, so the individual can lose the self he can become, even the self he is, unless he grows toward his full potentialities.

Shakespeare expresses this same thought in *Hamlet* when he has Polonius say, "This above all, to thine own self be true". In other words, hold true to the greatest self you potentially are. "And it must follow, as the night the day", that the individual's relations with others will be also true.

If then, the development of the individual to his full potentialities is the real interest of his self, how is this to be achieved, and is selfishness involved? If selfishness is involved, we are left with our original paradox; if not, we have the understanding whereby the individual is freed of the necessity to conform to the values fixed by the crowd; he is free to be his real self.

Growth of the Self

The mechanism of the growth process, whereby full potentialities are to be attained, is based on a productive attitude of the individual, a concentration on all that goes forth from his self. We have often heard the observation, "I know this subject a lot better now that I have taught it to others", or "Discussing your problem with you has done much to help me with a problem of my own". In each case, that which was sent out from an individual helped both the receiver and the sender. As we approach and act toward others, we act toward ourselves. Fromm expresses it this way, "Whatever you do to others you also do to yourself". The poet Gibran offers the same thought when he writes, "Your neighbor is your unknown self made visible". Whenever we act to help another's self, we help our own self; whenever we neglect to help another's self, we neglect our own self. The latter is particularly important because, "The road to Hell is paved with good intentions".

To concentrate on one's own self exclusively, is not possible or even desirable in this process of growth to full potentialities. Each is bound up in the lives of others through this human relations "action and reaction." The self cannot be turned inwardly but must be directed outwardly toward others, if it is to ex-

perience growth. This outward turning need not be world-shaking, need not be the astounding discovery in the science laboratory, or the development from which a company derives great profits. It can be as small as the friendly greeting in the hall, the constructive word of advice, the attentive listening to another's problems. For the environment within which we each live and work is made up of just such small things. And it is in this environment that the individual can free himself for greater contributions in his chosen field and greater growth toward the full potentialities of his self. The individual's self, therefore, is affected by every thought, word, and action that proceeds from him.

O. A. Ohmann expresses this as follows, "Each of us in his own experience knows that the times when we have really lived, the peak experiences of our existence, have been those rare occasions when . . . we were lost in service to our fellow man". Therefore, pursuit of the real interest of self is a process of growth, a process which concentrates the efforts of the individual on all that goes forth from him.

The fact that growth to full potentialities is an outgoing process suggests that its effectiveness is largely dependent upon the individual's desire to give of his best. This desire, on the part of a leading Chicago executive, was attested to recently with the remark, "So you used to work with M. also. Do you know, there's practically nothing I wouldn't do for him. I always felt that he gave me the best that was in him whenever I went to him".

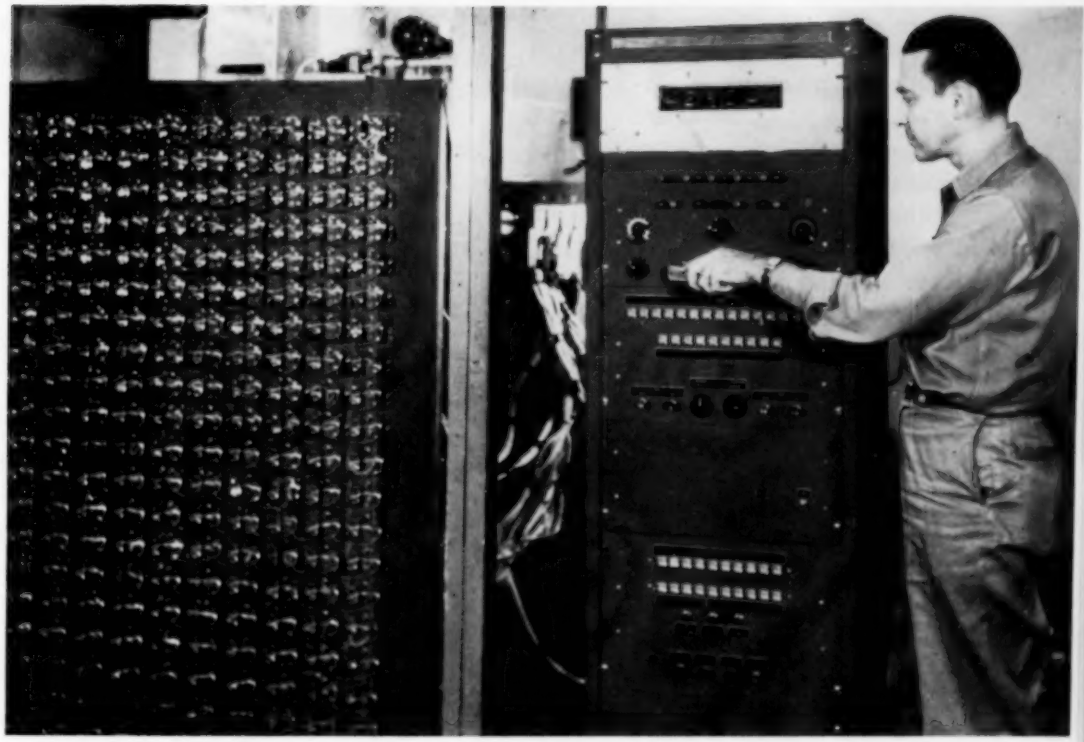
Concern for Real Values

Every day as we go about our appointed responsibilities, we can take the attitude that the best of ourselves will be put forth. This applies whether we are talking with someone, writing a paper for an unknown audience, or striving in the laboratory. It is this attitude of genuine concern for what goes out from us that is essential for real and lasting growth of self with its attendant satisfaction. This is not selfishness. Rather, it is the evidence of a decision to develop one's potential by adoption of what can be termed "real" rather than "false" or "illusory" values. On occasion, society recognizes the growing individual through his productivity. This recognition takes the form of the very rewards that it holds to be "success", the objectives which many seek unthinkingly. In its recognition, it is doing no more than this; it is not bringing "success" about. Baum in his story, *The Wizard of Oz*, brings this point out quite simply. The Cowardly Lion is given a medal for bravery, and all consider him brave. He had already developed this characteristic, however, through outgoing action. The medal merely recognized what already existed.

In our society, because a man is awarded a medal for a technical paper does not make the paper excellent or increase the writer's ability one iota. It merely calls attention to the excellence of the paper and the writer's ability. Likewise, placing a man in a new position of responsibility does not provide him with the ability to discharge his responsibilities effectively. The assignment merely recognizes his potential.

We cannot assume, however, that society will automatically recognize and reward the growth of the individual who has placed maximum emphasis on service. On the contrary, it is frequently oblivious of this growth. The individual reaching for the interest of his self will not look to society for rewards and satisfaction. He will look within himself, for it is there that they are to be found. Those things that were considered to be "success", those things that when gained were found to lack the substance of real satisfaction, now become completely secondary to the real interest of self, growth to potentialities. The individual takes the attitude of "What's in it *of* me", not "What's in it *for* me". To this person, Maslow applies the description, "the fully growing and self-fulfilling human being, the one in whom all his potentialities are coming to full development, the one whose inner nature expressed itself freely rather than being warped, suppressed, or denied".

To accept the challenge to develop to full potentialities, the individual must have faith—faith, first of all, in his self's potentialities and faith that they were created in him for realization in the future. Second, he must have faith in the future that surrounds him, that it will provide opportunities for his growth efforts. Third, he must have faith that our society can be better even amidst the problems with which we have confronted ourselves. Fourth, he must have faith that this purpose for his life is a real and satisfying purpose, that every step in progress toward it will bring deep encouraging satisfaction. Fifth, he must have faith in the good will and intent, the judgment and competence of those with whom he has chosen to associate himself in his work, his neighborhood, his church, and his social circles. Lastly, he must have faith that in his efforts he will not be without help, both from his fellowmen and from his Creator. Only with faith, therefore, can the individual embark on his life's effort of attaining his full potentialities; only with faith can he be himself, his best self.



Study of the behavior of large numbers of components is important to the reliability engineer. The automatic equipment on the right reads and records data from specimens housed in the environmental chamber behind the control board on the left. The equipment can make 1500 readings per hour and the data can be analyzed quickly by computer. Such facilities are helpful in developing faster and better statistical methods for determining component reliability.

Reliability Engineering Today and Tomorrow

Product reliability has long been a matter of concern. Costly and complex equipment now required by the military and by industry has made reliability of even greater importance. To meet the challenge, reliability engineers have moved from empirical evaluations to primarily predictive techniques employing statistical and other theoretical methods of evaluation. The author discusses the various elements that combine to make up reliability engineering today and considers the field's potentialities.

by KENNETH E. COCHRAN

HOW CAN WE MAKE SURE THAT autos, television sets, and other personal equipment will not require repairs so often that owners despair? How can the Armed Services have confidence that their rockets, communication systems, and atomic powered equipment will operate as desired? How can a company be certain that its products, when sold, will stand up satisfactorily under use? These are problems which a new field, reliability engineering, is well on its way to solving.

The importance of product and equipment reliability has long been recognized. But it has only been recently, with the emergence of today's highly complex equipments, that the field of reliability engineering has received wide acceptance and encouragement. Reliability is, of course, desirable because of the product dependability we would like to have. At the same time, it is an important economic factor. Both the consumer and the manufacturer gain when products stand up better under use.

For the past several years, almost every manufacturer has been exposed to reliability engineering. In

some industries it is already a way of life; thus in the electronics industry, "reliability" is practically a universal slogan. At the same time, reliability engineering is growing in importance for many other industries as its significance becomes better understood.

With growth in the sophistication of the field, reliability engineers have ceased speaking in generalities; they have developed quite clear conceptions of the directions in which reliability is moving and where it is likely to go. In this article, an attempt is made to summarize those conceptions.

What is Reliability?

In general, those who are concerned with the problem will agree that reliability may be broadly defined as: the *probability* that a device will *function properly* in the *expected environment* for the *time intended*. . .

The four italicized phrases indicate the four key facets of reliability engineering. Dependability, or reliability, has long been a concern both for manufacturers and consumers. Indeed, the guarantees that many products carry are in themselves statements of the time the manufacturer believes the product will be trouble free. In general, this earlier knowledge of dependability was based upon experience and empirical evaluations of the completed product.

What we now know as reliability engineering, on the other hand, is essentially a predictive science. It is concerned with the prediction of how long equipment will last in a specific environment. It is also much more. Reliability engineering provides the techniques for developing products with a designated life span, and for improving products so that they will meet higher requirements. To carry such a proposed product through to manufacture also requires consideration of such matters as the selection of materials, setting up and operating the production process, determining desirable quality-control measures, and devising the means for assuring the maintenance of quality.

As a predictive science, reliability engineering uses other methods than the cut-and-try experiments that are so generally known. Hence, much use is made of theoretical studies for determining the designs and materials best fitted for the desired product. Computers, naturally, play a big part in such studies, enabling engineers to analyze and select the most promising designs before building any models. By such techniques, much of the preliminary activity can be speeded to completion at relatively low cost. Of course, empirical evaluation of components and systems, after prototypes have been built, still plays an important part in the whole reliability procedure. The final proof of a component's or system's dependability always comes in its operation and use.

In general, the various aspects of reliability work can be identified with one or more of the general areas listed below. Together, these nine areas make up the total concept of reliability engineering. They may be stated as follows:

1. Setting reliability requirements
2. Design analysis
3. Development of evaluation techniques
4. Quality control
5. Quality assurance
6. Specification engineering
7. Environmental evaluations
8. Failure analysis
9. Data analysis and presentation

Setting Reliability Requirements

How can we measure a product's quality and assign it a required quality level? The best single measure is the answer to the question, "How long will the product last or perform properly, without repair?" In short, "What is its reliability?" An automobile battery with a 36-month guarantee is assumed to be of higher quality than a battery with only a 12-month guarantee. In producing and marketing automobile batteries the manufacturer has been able to assign reliability requirements based on his market, and he has been able to meet these requirements.

Since joining the Institute staff in 1948, Kenneth Cochran has participated in studies on semiconductor materials, the development of solid state devices such as dry-plate rectifiers, capacitors, and resistors, and guided a program of tropical studies on electrical components. More recently he has been concerned with the development of reliability programs on mechanical and electrical equipment systems and components, programs designed to obtain data for the preparation of military and industrial specifications, and with the over-all problems of developing new or improved electronic and other components. The author, who is chief of Battelle's reliability engineering division holds membership on both the Electronics Committee and the Subcommittee on Reliability and Quality Control of the American Institute of Electrical Engineers.

Unfortunately, as products become more complex, reliability or quality requirements are increasingly difficult to assign. The degree of reliability demanded in a product depends largely upon the consequences of its failure to the user. In an automobile, a failure could mean total catastrophe, severe inconvenience, or merely a nuisance, depending upon which part failed. Certain complex products, then, require the establishment of several levels of reliability.

To establish reliability requirements, the manufacturer must carefully analyze the following factors: (1) the possible price range of the equipment as determined by a study of the market; (2) the uses of the equipment and the consequences of its failure; (3) the state of the art.

Once the reliability requirements for the complete product have been established, those for individual components may be set. With some knowledge of the environmental stresses encountered by the system during normal operation, the reliability engineer can draft realistic parts specifications to insure the maintenance of the agreed upon quality level.

Economics and sound management practice demand that reliability requirements be set at completely realistic levels. Once established, the requirements provide the engineer with the standards he needs for setting up the parts specifications.

Design Analysis

The ultimate key to the reliability of equipment is its design. Even the most careful selection of components, based on the most sophisticated evaluations, can do little to improve the reliability of an unsound design. The manufacturer of ultra-reliable equipment, therefore, must make certain that the design of his equipment is as sound as the state of the art allows. His concern about design analysis should be proportional to the degree of reliability required.

Design analysis may properly be termed "design optimization". In this work the reliability engineer makes full use of his skills in component evaluation and of computer technology. He is concerned with the prediction of component degradation as related to time and the resultant effect on the operation of the entire equipment. By making use of component life evaluation data, he can arrange required component tolerances within the equipment so as to provide the optimum functional life of the equipment. These techniques have already proved their worth in optimizing equipment maintenance schedules and in other ways. Their use has resulted in tremendous advances in equipment reliability, especially when applied to extremely complex systems.

Development of Evaluation Techniques

Over the past several years, evaluation techniques have grown increasingly sophisticated. Thus the numbers of samples being used in reliability determinations have grown. By developing combined environments, engineers are able to simulate actual operating conditions more closely. Development of the digital voltmeter has not only increased the accuracy of measurements, but has also made possible the automatic measurements of large sample sizes. Moreover, better experimental designs are being used which measure a wider range of parameters and thus provide more meaningful data.

One of the most significant advances has been the development of accelerated tests and screening procedures. With these procedures, the reliability engineer can rather quickly predict, on the basis of relatively brief evaluations on a number of samples, the reliability of a particular batch of, for example, electronic components being considered for production use.

Quality Control

Quality control is the process by which product-quality information is made available in the production operation. This feedback function is not often easy to establish. The problem is one of relating measures of product quality to a particular production operation or combination of operations. Once this relationship has been established, quality slippage, as gauged by quality-assurance data (see below) can be traced to a particular faulty manufacturing operation. With the faulty technique identified, the production engineering group can take measures to correct the error.

Sufficient statistical measures of quality provide two means for improving production efficiency. First, the data can be fed back through the production engineering group to help it maintain a uniform product which adheres tightly to specified requirements. Second, the ease with which a particular specified requirement can be met is readily determined. This information has manifold implications in both production economics and product development research. For example, assume that through quality-control procedures, a particular product has stabilized at a point well above the minimum required quality level. Two advantageous actions are possible: either the costs of 100 per cent quality inspection may be reduced by turning to sampling, or quality requirements may be raised, leading to a higher quality, high-reliability, higher priced product.

If, on the other hand, the reverse condition is evident

When he knows the reasons for failure, the reliability engineer knows where improvements in a product are needed. Visual examination under a microscope is still one of the best methods for determining how transistors fail. However, . . .

and the stabilized quality distribution falls below the minimum acceptable requirement, three courses of action may be pursued: (1) further research may be worthwhile; (2) the cost of the product may be modified to justify 100 per cent inspection and a high percentage of scrap; or (3) the production of this item may be discontinued.

The over-all advantages of a statistical quality-control program may be outlined as follows:

1. Product uniformity can be maintained within tight limits through information feedback; hence, scrap production may be reduced to a minimum.
2. The program provides a sound basis for price determination.
3. The best cost relationship of product quality, research and development activities, and production facilities can be determined more easily.
4. Costly 100 per cent inspection can be minimized.
5. The product uniformity effected by quality-control techniques can eventually lead to higher degrees of component reliability, and, hence, to advancement of the state of the art.

Quality Assurance

The function of a manufacturing organization is to make a profit by processing, fabricating, or assembling products which meet a consumer demand. Basically, the manufacturer's success in fulfilling this function depends upon his ability to satisfy his customer. The survival of companies depends upon their ability to meet consumer demands over an indefinite period. Quality assurance, by maintaining and improving the desired or advertised qualities of products, is one of the most important factors in assuring survival.

Quality assurance, which is based upon inspection procedures, is important in all phases of manufacture. It may be introduced into any of the phases of production—from raw materials processing to parts assembly; from inspection of incoming materials through in-process inspection to final inspection.

Quality assurance techniques are necessary to implement quality control techniques. Inspections can aid the purchasing department by monitoring the quality of incoming parts and thus aid in gauging the suppliers. Also, quality assurance procedures can provide constant monitoring of a plant's production efficiency and aid in price fixing and price forecasting.

Unfortunately, however, inspection is costly and if the procedures are unnecessary or ineffective, the resulting higher production costs may prove damaging to sales in the competitive market. For this reason, quality assurance cannot be blindly introduced into a manufacturing system. The cost of establishing an inspection point in a process must be carefuly weighed against the quality advances gained.

How can the best quality assurance procedure be developed? Cooperation between the raw materials or parts supplier and the user is one very important step. Also, thorough study and knowledge of the probable effects of material or part weaknesses on the quality of the finished product will help determine the best arrangement of inspection stations. Critical study of the inherent capabilities and weaknesses of the item produced can result in both better quality control procedures and more realistic guarantee or warranty periods.

Specification Engineering

Specifications are nothing more than formal statements of required or expected characteristics which serve to guide the development of products or processes. We hear most about specifications in connection with the military, but they are, of course, utilized extensively in private industry.

Specification engineering is, in the broadest sense, a study concerned with the development of the most effective and dynamic methods for generating, analyzing, and presenting valid engineering experience for the guidance of planning, producing, and selling products. Specifications are, naturally, based primarily on experience with a product or process. In preparing them, the engineer must establish realistic objectives; he must carefully analyze the planned use of the specifications so that their requirements are neither too stringent nor too lax. The basic types of specifications are discussed below.

Target specifications set the objectives which de-

signers and management agree upon as the properties desired in a new product. The specifications give the designer his first rough set of goals; and those goals, with such modifications as may be made, stand until the first prototype has been built. Then the working specifications are prepared.

Working specifications cover the complete plant activity in connection with the production of a proposed product; it extends from the receipt of materials, components, and devices into the plant, through manufacture and assembly, to the final inspection before shipping.

Reliability plays an important part in many of these steps. Thus specifications for incoming materials or parts must be drafted with a good understanding of how initially measurable performance variations are likely to influence production and the end product. If requirements are more stringent than needed, unnecessary costs are added to the item procured. If requirements are too low, costs are increased by low production levels, low product quality, and other manufacturing problems. A proper balance between incoming quality and end-item quality, keeping in mind the desired end-item use, is necessary to produce an item at minimum cost.

Unfortunately, such balance is not easy to hold. For example, introduction of a new material, with imperfectly understood properties, may cause major manufacturing difficulties or high customer returns because of field failures. Inspection is not enough to prevent this. New materials, parts, and subsystems should be introduced only if their effects on the quality of the item are known.

Sales specifications for the use and limitations of products are also important. If they are too liberal, or based on invalid experiences, failures will occur in the field, with the inevitable return of goods and loss of customers. If too conservative a view is taken in setting up specifications, sales may be lost in the competitive market. As with working specifications, the sales specification must strike a balance based on a realistic rating for use of the product.

Environmental Evaluation

We are bombarded daily with information about how products perform under their intended environments. For example, automobile tires and batteries are tested and advertised to withstand environmental punishment for guaranteed periods of time. The automatic washer, subject to severe environments of heat, dampness, soap chemicals, and vibration is designed to be relatively trouble free over perhaps a five-year guarantee period. Military equipment, such as a missile guidance system is subject to very severe environments. If, in these cases, environmental evaluations were not conducted, reliability would be lacking, product improvement would be difficult, and manufacturers would have no basis for advertising claims.

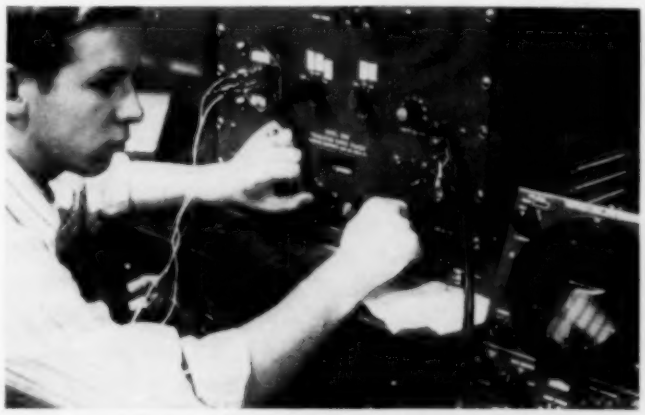
The question is not *whether* operating conditions should be considered, but *which* operating conditions should be considered, and in what detail. All equipment, both military and commercial, is subject to degradation from environmental stress. In order to measure the extent of life degradation in a device under a particular environmental stress, it is necessary to subject that device to one or a combination of controlled environments. Environmental evaluations may serve several useful purposes:

1. To measure quantitatively the reliability of a set of identical devices under some particular environmental condition.
2. To compare the ruggedness of two or more similar, but not identical, devices for some specific application.
3. To gauge the acceptability of a device for quality inspection or quality control purposes.

Most well equipped laboratories are capable of reproducing the following basic environments under controlled conditions: high and low temperatures, humidity, salt spray, acceleration, sand and dust, sunshine, vibration, shock, and nuclear radiation.

Various combinations of these environments are often used simultaneously to simulate more effectively the expected operational condition. Skillful laboratory evaluations may be of value to a manufacturer for:

1. Selecting the best components for use in his equipment.



. . . other techniques are equally useful in evaluating components. With this equipment, spotting weaknesses or failures is simplified by superimposing actual readings from a component upon simulated ideal readings. The engineer can thus quickly learn what component parameters are changing or how various parameters compare with optimum values.

2. Showing potential weaknesses in his design.
3. Providing information for sales promotion use on how his equipment performs.
4. Indicating where further research and development are needed to improve a product.

Environmental evaluations may also be used as a tool to check production processes or to serve as a final inspection. Thus, a properly designed vibration inspection test can indicate loose screws or parts and show weak mountings or brackets without decreasing the life of those items passing inspection. Vacuum tubes, hydraulic valves, and other products may be sampled on a statistical basis, the selected samples being subjected to the simulated operating condition. From the evaluation, inferences can be drawn as to the population sampled and, hence, the quality of the production lot to be judged.

Failure Analysis

We have attained what can be truly called "a frustrating level" of reliability. Despite our high level of proficiency, parts and systems still fail and we are often at a loss to explain the casualty on the basis of previously experienced life information. Thus a customer wrote to a company:

> This motor, one out of 30 operating in the system, was just loafing along driving 25 per cent of its intended load and yet it failed. We had another failure just like it last month. Why?

Obviously some new factor, some new variable had been added to those factors already taken into account in designing the equipment and deciding the safety factors.

We invariably learn to avoid mistakes by first making them and then analyzing what we did wrong. The failure of the "reliable" motor is a case in point. If the ultimate cause for unpredicted failure—this newly introduced factor—can be identified, intelligent design changes can be made to prevent future failure occurrences. If we do not pause to analyze the failure cause, we have failed to use valuable experience.

Failure analysis often is the only way in which stresses imposed on a component under a particular application can be correctly determined. Often inconsistencies and errors in component-part manufacturing processes can be identified for correction through failure analysis. Failure analysis can also provide clues to component weaknesses which, when present, are indicative of early failure. Hence, failure analysis techniques are extremely useful in establishing component screening techniques.

No short cut to reliability exists, but failure analysis comes the closest. The data already exist, we have only to analyze them.

Data Analysis and Presentation

Along with the advances in techniques for gaining reliability data, there has been much progress in analyzing and presenting the data obtained.

Reliability engineering is by definition a predictive science. Its statistical techniques are utilized to obtain data on the performance of parts and systems so that informed estimates can be made of the probability of a device performing adequately for the time intended. Earlier, engineers gained performance data from costly, time-consuming large-scale evaluation programs. These aided the development of more effective statistical techniques and better device reliability statements. And, as a result, reliability engineers have been able to shift from mass methods to less costly, more rapid screening and evaluation procedures for particular applications.

The improvement of methods for presenting available data is also important. The better the presentation, the more useful data will be to designers, engineers, production personnel, quality control personnel, and others. Many techniques are concerned with mechanics of presenting data; for example, varied colors are used to get more curves on one sheet for comparison. Other techniques are concerned with advanced statistical and analytical concepts, such as linear discriminant analysis, joint parameter distributions, and modeling. However, the ultimate advances in reliability engineering will be largely dependent on the analytical and predictive techniques employed.

Thoughts on the Future

Today, reliability is well on the road to general acceptance. Governmental agencies, of course, already make it a practice to ask for reliability engineering in their contracts and specifications. Many companies, too, have formed management groups to work toward higher reliability goals. Working with governmental agencies and by themselves, companies are finding better ways of producing quality items. Moreover, the realization is growing that the cost of reliability is more than balanced by savings in repair, inspection, and longer product life. Even the public is coming to recognize the desirability of reliability as a means of obtaining more dependable products and of reducing the costs of service and warranties. Therefore we can expect that reliability, under some name, is likely to be included as a key step in most production processes.

The still increasing complexity of the equipment being developed by the defense services and other governmental agencies will make reliability engineering even more important in the future. Heretofore, chief emphasis has been placed upon electronic equipment; hereafter the application of reliability concepts may be expected for hydraulic, mechanical, and other types of equipment.

We can expect equipment to be designed for use under even tougher environmental conditions. Hence, growing amounts of high quality reliability data will be needed. This, in turn, means that better statistically designed experiments and more data taking will be required. More cooperative efforts between companies needing and using similar data may be expected; and the need for cooperation points up the desirability of a center for the experimental generation of new data and the storage of available information.

As research intensifies, we can expect the development of new methods for analyzing and processing data. Computers will, of course, be used increasingly for simulating the effects of component or material changes in the system. It is conceivable that computers will be used to "theoretically" build parts and evaluate their performance under simulated environments. The potential value of such a technique from the viewpoints of both economics and time are clearly obvious.

The wider use of the techniques of reliability engineering in industrial and consumer equipment fields is likely. Such techniques would be especially advantageous in the design changes in existing equipment and in the design and production of new items. Reliability procedures can lead to better designs, incoming inspection and acceptance procedures, quality control procedures, and quality assurance. Such procedures can also help to save time and costs in developing and proving prototypes.

In another area, reliability engineering can increase customer satisfaction with products. Today, the problem of service on consumer products is a sore point with many people. Many consumers would be willing to pay a premium for equipment with realistic guarantees of trouble-free operation. We are likely to see reliability engineering techniques utilized to produce higher quality equipment and to provide data for realistic warranty policies.

These considerations of possible and probable developments in the future emphasize that reliability engineering is really good, sound, over-all engineering of any type of product. As such, developments in this area promise to play an increasingly important part in many technological and industrial fields in the future.

MALTHUS AMENDED

"Of all the long-range prophesies, the theory of Malthus may well be the most plausible and the most inaccurate. About 150 years ago he predicted that the population of the earth would tend to increase faster than the food supply. Since he made his dire predictions the rate of population increase has continued to reach higher and higher levels—and so has the standard of living throughout most of the world. It is true that conditions are wretched in many countries; but even where life is hard people are objecting not because they look back to a happier past but rather because they demand a better future—which they know can be realized. Human fertility is undoubtedly great, but so far human ingenuity has proved greater. I suspect that ultimately the population of the earth will be limited not by any scarcity but rather by our ability to put up with each other."

Edward Teller, Associate Director,
Radiation Laboratory, University of California

NOTES from BATTELLE

* CARBON-FILM-RESISTOR STUDY

Carbon-film resistors have provided the electronics industry with a reasonably priced, semiprecision resistor since World War II. Currently, studies are under way to determine more closely the various qualities of these components. H. M. Braner and J. L. Easterday report that such resistors were recently studied at Battelle. The stability of the resistors was investigated under conditions of a rated load and in an ambient temperature of 70 C for 12,000 hours.

A two per cent resistance deviation from the initial reading was arbitrarily considered as failure. The various types of carbon-film resistors (with a nominal tolerance of ± one per cent) showed average failure rates ranging from 0.13 to 2.3 per cent per 1000 hours. Some types showed catastrophic failure and case defects similar to crazing on the outer surface.

Borocarbon-film resistors showed an average failure rate of ten per cent per 100 hours. Most of them had failed within 9500 hours.

A number of individual resistors showed highly desirable properties. The results of the study suggest that further development of cases and greater control over film properties during manufacture would lead to fixed resistors with superior life characteristics

* RADIATION OF "BOTTLED" OXYGEN

Anticipating the day when nuclear-powered aircraft take to the sky, Battelle scientists have begun research to determine how nuclear radiation may affect the "bottled" oxygen supply of aircraft crews. In a one-year study they are seeking to find out whether breathing oxygen might be made unusable when stored outside the shielded area designed to protect crew members. The research is being sponsored by the Air Research and Development Command at its Wright Air Development Center.

"It is already known that oxygen subjected to nuclear radiation can form ozone, and that gaseous impurities in the oxygen may become radioactive", Dr. John Farley Foster, a chemist concerned with this study, explained. "But whether 'bottled' oxygen exposed to radiation will present a real health hazard is not known. That is the reason for our study."

Dr. Paul Schall, Jr., a radiation specialist working on the study, said that it would be possible to build special oxygen containers to shield oxygen from radiation, if research indicates this is necessary. He added, however, that special shielding devices would contribute to the weight problem facing the designers of nuclear aircraft. "Studies, such as this one, may help to show designers where they can safely eliminate heavy shielding", he said.

To find out how radiation affects "bottled" oxygen, the Battelle scientists will subject an oxygen container made of materials similar to those used in present-day containers to radiation for periods up to 40 hours. The Battelle nuclear reactor and cobalt-60 facility will be used to obtain both gamma and neutron irradiation. The intensity of gamma radiation to which the oxygen equipment is exposed will range from 200 to 2 million roentgens per hour. By this procedure, scientists believe they will be able to predict any chemical or radiation hazard to breathing that airmen of the future may face.

* HEATING IN METEORITES

The importance of returning parts of missiles or rockets safely through the earth's atmosphere has helped to intensify interest in research on the problem of atmospheric heating. As one part of the research on this problem, a careful examination was made at Battelle for the Aeronautical Research Laboratory, Wright Air Development Center, of the effects of heating upon the Grant meteorite. Having studied the data gained from the examination of the meteorite, Institute staff members R. E. Maringer, G. K. Manning, and L. R. Jackson have been able to draw certain conclusions.

In explaning how the data were gained, they point out that meteorites enter the earth's atmosphere at very high velocities, that is, seven miles per second or higher. At such speeds, of course, the surfaces of the

meteorite become tremendously hot, melt, and the molten material is swept away by the air flow. Between the molten surface and the cold core of the meteorite is a thermal gradient, a region of gradually moderating temperatures. The thermal gradient causes certain structural changes near the surfaces of an iron meteorite. These changes form a record of the thermal environment through which the meteorite has passed. It was this record which the technologists studied.

They found that melting rates on the surfaces of the Grant meteorite varied, probably because it was tumbling as it fell. The average rate of ablation—or loss of surface material from the meteorite—was placed at about 1 to 2 mm per second. They estimate that if the meteorite was passing through the earth's atmosphere for 20 to 30 seconds, the total amount of ablation was from 2 to 6 cm. This figure is somewhat lower than, though in general agreement with, other, earlier estimates of ablation in meteorites made by different approaches. The Battelle technologists conclude that actual losses from ablation may be considerably smaller than had been theoretically estimated.

* PREDICTING JET ENGINE LIFE

A study to determine a reliable method for predicting jet engine failures and malfunctons is being conducted at the Strategic Air Command's Lockbourne Air Force Base by a research team from Battelle. The study is sponsored by the Flight Control Laboratory, Wright Air Development Center. Final aim of the research is to develop a simple totalizing recorder-computer that could be installed on jet engines to predict expected service life or the need for maintenance.

Jet engine trouble does not "just happen", says Fred Bagby, head of Battelle's aeronautics and thermodynamics division. Certain aspects of an engine's behavior, when analyzed, may provide clues to its future behavior. The recording device for jet engines, which the Battelle team plans to design, would record the significant "tell-tale" aspects of engine behavior.

In the current research, Battelle specialists designed, built, installed, and are operating a system for recording a complete, continuous "life history" for each one of several jet engines. At least 5000 hours of operating time will be recorded. The research apparatus is being used to record, for each engine, information on twelve conditions such as exhaust-gas-temperature, engine revolutions per minute, air speed, etc. To determine which of these factors are most significant in predicting engine life, the data on each engine will be stored until the engine eventually begins to develop trouble. Then the "life history" will be studied for early clues to the trouble.

In contrast to most flight testing, which usually involves flights of a few hours or even minutes, the Battelle "life histories" will cover a period of two to three years. The data-recording apparatus begins to function automatically whenever an engine is started, thus insuring complete record of engine life.

* A recent short study, an offshoot of research on the decomposition mechanism of materials possibly useful as high-temperature lubricants, has provided insight into a little understood chemical reaction. In the course of the research, the thermal breakdown of diphenyl sulfone was investigated. Sulfur dioxide and benzene are the principal decomposition products of the reaction. Battelle chemists, noting that the concentrations of the products decrease noticeably, puzzled over what happens when decomposition is complete at temperatures of 900 F and higher.

Battelle chemists Arthur Levy and Charles J. Ambrose undertook to learn how sulfur dioxide and benzene react at the critical temperature. They found that the two materials react by a complicated process, compatible with second order kinetics. Products formed by the process, the chemists report, are sulfur, dibenzothiophene, a polymer residue, carbon dioxide, carbonyl sulfide, oxygen, and traces of carbon disulfide, hydrogen sulfide, and water.

* *Newly appointed*: Dr. John M. Blocher, Jr., Chief, Inorganic Chemistry and Chemical Engineering Division, who will guide research on the preparation of high-purity metals, extractive processes for refractory metals, and refractory and metallic coatings.

* A new five-page publication on the metal cobalt includes general information on the element, data on electrical and magnetic properties, mechanical properties, high-temperature properties, transformations, diffusion, solubilities of oxygen in cobalt, and hot hardness. Also included are data on 99.6 per center cobalt—ultimate tensile strength, elongation, reduction of area, elastic modulus versus temperature, etc. It is available from the Cobalt Information Center, c/o Battelle Memorial Institute, 505 King Avenue, Columbus 1, Ohio.

Writings by STAFF Members

Chemical Engineering Progress, v. 54, November, 1958, contains the following articles by staff members:

Future Metals. H. R. Ogden, pp. 54-57.

Tungsten, tantalum, molybdenum, chromium, vanadium, niobium, and rhenium appear to have the best potentialities for extending the limits of present-day materials of construction. Each of these metals has attractive properties such as good strength at high temperatures and/or corrosion resistance, which make them suitable for use in the fields of chemical equipment, high-temperature jet engines, rocket motors, high mach number airframes, and missiles, and other specialized applications.

Ceramic Materials for High-Temperature Applications in the Chemical Process Industries. M. Jack Snyder, pp. 65-66.

Reviews properties of ceramic materials and their application in some high-temperature processes. A survey of future needs and probable future developments in ceramics indicates possible improvements in materials for use up to about 5000 F; at higher temperatures, it is likely that some expedient such as cooling the walls, use of reactants as the container, or levitation would be employed in developing the process and be adapted to commercial operation.

"Transactions of the American Foundrymen's Society. Proceedings of the Sixty-Second Annual Meeting." v. 66, 1958, contains the following papers by staff members:

A Method of Casting Radiator-Type Fuel Elements for a Nuclear Reactor. A. W. Hare and R. F. Dickerson, pp. 210-212.

The casting of perforated-hexagon subsections which were 2 and 4 inches high and about 3.9 inches wide containing 397 perforations, 0.165 inch in diameter, was found to be quite practical. Optimum casting conditions for the chromium-uranium eutectic alloy were found to be pouring temperature of 2000 F with a graphite mold temperature of 1600 F. Although the mold and the core costs for this melting and casting operation are relatively expensive when compared to normal melting practices, the fact that this shape could be cast makes possible the production of such a shape without the addition of excessive machining costs. Casting of larger sections of the perforated hexagon appears to be quite feasible, but the core-alignment problem probably would increase with an increase in the length of casting.

The Effect of Size of Scrap on the Tapping Temperature of a Cupola. N. H. Keyser and W. L. Kann, Jr., pp. 397-398.

Although most operators of cupolas know the general nature of these effects, few know them in sufficient detail to apply numbers to the effects. This paper describes the results of an investigation to determine quantitatively the effects of changes in the size and weight of pieces of cast iron scrap on the tapping temperature and required coke ratio in one particular type of cupola operation. The operation under study was unusual in two ways. First, the charge contained an unusually large percentage of cast scrap. Second, the operation of the cupola is unusually critical because of stringent requirements for close control and excellent uniformity of the iron produced.

Constitution, Metallurgy, and Oxidation Resistance of Iron-Chromium-Aluminum Alloys. Walston Chubb, Sam Alfant, Arthur A. Bauer, Edward J. Jablonowski, Fred R. Shober, and Ronald F. Dickerson. U. S. Atomic Energy Commission, BMI-1298, October 16, 1958, 104 pp.

The constitution of Fe-Cr-Al alloys was investigated employing high purity materials. Ternary sections are presented. The physical metallurgy of Fe alloys containing 25 to 35 weight per cent Cr and 3 to 8 weight per cent Al was investigated to determine their usefulness as structural materials. The oxidation resistances of Fe-23.7 weight per cent Cr-6.0 weight per cent Al alloy and of Ni-20.0 weight per cent Cr-1.1 weight per cent Cb alloy were compared at 1900 and 2100 F in air containing additions of water vapor, CO_2, and combinations of water vapor and CO_2.

The Electrochemical Industry—Fifty Years of Progress. Charles L. Faust and L. D. McGraw. *Industrial and Engineering Chemistry*, v. 50, November, 1958, pp. 46A-49A.

Reviews developments in the past 50 years in the fields of industrial electrolysis, electroplating, electrowinning and electrorefining, electrothermics, electro-organics, batteries, and electronic applications. Forecasts continued progress in these and other fields, especially in applications in nuclear materials and fuel cells, and long lines predicted by theoretical electrochemistry.

Preparation and Electrical Properties of Mercury Telluride. T. C. Harman, M. J. Logan, and H. L. Goering. *Physics and Chemistry of Solids*, v. 7, nos. 2/3, November, 1958, pp. 228-235.

Mercury telluride was prepared by direct reaction of mercury vapor with liquid tellurium. The compound was zone melted and annealed in mercury vapor under various pressures of mercury. It was found that the composition near stoichiometry could be altered by the anneal. Hall coefficient and resistivity were measured as a function of temperature. Analysis of the results gave 0.02 eV for the energy gap at 0°K and a hole to electron mobility ratio of 0.01. The Hall mobility was 17,000 cm^2/Vsec at 300 K and 25,000 cm^2Vsec at 143 K.

Planning—and Operating a Critical Facility. F. J. Janowski and J. W. Chastain. *Nucleonics*, v. 16, December, 1958, pp. 48-50.

Covers site selection, critical-facility building design, equipment, and proposed staff in planning phase, and fuel design, hazards evaluation, assembly preparation, and operating rules in the operating phase.

Protective Organic Coatings for Steel. II. Louis J. Nowacki and E. R. Mueller. *Industrial Heating*, v. 25, November, 1958, p. 2308 + 4 pages.

Describes finishing systems for coating steel, including the proper preparation of the steel surface for painting; the right combination of coating materials including primers, primer-surfacers, fillers, and top coats; the correct application of the coating materials; and proper curing of the coatings.

Chemical Conversion Coatings for the Lubrication of Titanium. E. L. White and P. D. Miller. *Lubrication Engineering*, v. 14, no. 11, November, 1958, pp. 479-482.

Titanium and its alloys have a severe tendency to seize and gall when in moving contact with themselves or other metals. Lubrication of the bare metal has been successful only to a limited extent. Galling can be greatly reduced by using chemical conversion coatings with lubricants. Both anodic coatings and simple dip coatings hold lubricants effectively and eliminate or reduce galling in wear applications. The results of wear testing, wire drawing, and cold forming of sheet using conversion coatings are discussed. A satisfactory coating can be formed on titanium by anodizing in a 5 per cent solution of NaOH. A fluoride-phosphate conversion coating can be formed by simple immersions in a solution containing HF, KH, and Na_3PO_4.

Members of the Battelle staff are authors of the recently published articles and books listed on these pages. In most cases, reprints are available from the Battelle Publications Office, 505 King Avenue, Columbus 1, Ohio.

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AERONAUTICAL ENGINEERING

1173 Aerothermoelasticity. Discusses some of the effects of aerodynamic heating on aeroelastic phenomena and indicates the possible impact of this consideration on contemplated design practices. ***Milton Rogers.*** *Aero/Space Engineering*, v. 17, Oct. 1958, p. 34 + 9 pages.

1174 Departure and Return in Interplanetary Flight. Deals with some of the three-dimensional aspects of orbits in close vicinity to the planet—i.e., orbits of arrival and departure—studied from the standpoint of flight economy. ***Karel J. Bossart.*** *Aero/Space Engineering*, v. 17, Oct. 1958, p. 44-52.

1175 Loss of Torsional Stiffness Under Load. Presents a refinement in structural analysis dictated by flutter requirements. ***Lloyd E. Hackman.*** *Aero/Space Engineering*, v. 17, Oct. 1958, p. 53-57.

1176 Design Considerations for BLC STOL Airplanes. Summarizes a design philosophy for high-lift boundary-layer-control airplanes and discusses problems connected with the development of short take off and landing aircraft. ***Fred G. Wagner.*** *Aero/Space Engineering*, v. 17, Oct. 1958, p. 58-64.

1177 Reliability Achievement and Demonstration in a Development Program. A program is outlined for improvement and demonstration of the reliability of liquid rocket propulsion systems and similar equipment using development test data. ***H. R. Lawrence and W. H. Amster.*** *Aero/Space Engineering*, v. 17, Oct. 1958, p. 65-69.

1178 Some Effects of High-Energy Fuels on Aircraft Performance. High-energy fuels and marked improvements in aerodynamic efficiency make possible supersonic commercial transports at take-off weights comparable to present jet transport designs. ***Abraham Hyatt.*** *Aero/Space Engineering*, v. 17, Nov. 1958, p. 45-50.

1179 Equivalent Configurations in Flutter Analysis. The concept of equivalence is introduced as the identity of flutter eigen values derived from equations of differing configurations; this concept serves to appraise qualitative flutter behavior in design and remedial studies. ***John D. C. Crisp.*** *Aero/Space Engineering*, v. 17, Nov. 1958, p. 55-61.

1180* The High Speed Flow of Gas Around Blunt Bodies. Unified theory predicts shock shape and detachment distance for two blunt bodies, a flat disc and a sphere. It is shown that the density ratio across a normal shock is a useful parameter, combining the effects of both the free stream Mach number and the ratio of specific heats. ***Hyman Serbin.*** *Aeronautical Quarterly*, v. 9, pt. 4, Nov. 1958, p. 313-330.

1181* Some Simple Results for Two-Dimensional Jet-Flap Aerofoils. Equations are derived giving lift coefficient and chord-line loading of a thin two-dimensional wing at zero incidence, with a narrow high-velocity jet issuing from its trailing edge at a (small) downward inclination. ***D. A. Spence.*** *Aeronautical Quarterly*, v. 9, pt. 4, Nov. 1958, p. 395-406.

1182* The Turbine Transport and the Commercial Scene. The so-called jet era has arrived. Now equipped with the largest and the fastest airliners that have ever been developed, the world's airlines will make a fresh bid for commercial traffic. The aircraft they will use to make this bid and the effects they will have on the air transport system are discussed. ***Roy Allen.*** *Aeronautics*, v. 39, no. 3, Nov. 1958, p. 22-36.

1183* Supersonic Aspiration. The design of air intakes and diffusers for supersonic aircraft and hypersonic wind tunnels is discussed. Also deals with the problems of solid propellent rocket motors and mentions work on nuclear propulsion for aircraft. ***A. R. Weyl.*** *Aeronautics*, v. 39, no. 3, Nov. 1958, p. 38-41.

1184 Annals of the International Geophysical Year. v. VI. Manual on Rockets and Satellites. Outline of IGY experiments of various countries; trajectory and telemetering fundamentals; atmospheric and ionospheric measurements. ***L. V. Berkner.***

editor. 508 pp. 1958. Pergamon Press, New York. (QC801.3 An72 Vis.)

1185 Inertial Navigation. II. Systems; performance characteristics; errors. ***C. F. O'Donnell.*** *Franklin Institute, Journal,* v. 266, no. 5, Nov. 1958, p. 373-402.

1186 The Boundary-Layer Equation for Axially Symmetric Flow Past a Body of Revolution—Motion of a Sphere. The equation is integrated asymptotically by the method developed for plane flow, where the partial differential equation is reduced to an ordinary equation. ***David Meksyn.*** *Journal of the Aero/Space Sciences,* v. 25, Oct. 1958, p. 631 + 4 pages.

1187 Utilization of Experimental Results in Flutter Analysis. The general problem of utilization of test data in flutter analysis is discussed. Methods for evaluating changes in flutter characteristics due to changes in structural and aerodynamic parameters are given. The precision of information obtained from tests is considered and the resulting accuracy of the flutter prediction discussed. ***Erik Mollö-Christensen.*** *Journal of the Aero/Space Sciences,* v. 25, Oct. 1958, p. 635-643.

1188* The Way to the Moon. Some of the many flight paths to the Moon and their prospects of success. ***T. A. Margerison.*** *New Scientist,* v. 4, Oct. 16, 1958, p. 1048-1051.

1189* Some Aspects of Refrigeration in Supersonic Aircraft. Performance of practical open and closed refrigeration cycles. ***E. J. Gabbay.*** *Royal Aeronautical Society, Journal,* v. 62, Nov. 1958, p. 769-786.

1190* Definitions to be Used in the Description and Analysis of Drag. Terms used in the description and analysis of the external drag of a body (with or without internal flow) are considered, and definitions suggested for the various components of the drag. *Royal Aeronautical Society, Journal,* v. 62, Nov. 1958, p. 796-801.

1191* Radio-Astronomy and Navigation. An outline of the history and present state of knowledge of radio astronomy is given, together with a more detailed treatment of the stronger localized radio sources. This is followed by a general account of the ways in which these radio sources may be used, and are being used, as navigational aids. ***C. M. Cade.*** *Royal Aeronautical Society, Journal,* v. 62, Nov. 1958, p. 805-828.

1192 The Computation of Orbit Parameters From Interferometer and Doppler Data. During the lifetime of its transmitter many transits of the first earth satellite were recorded at the Royal Aircraft Establishment and its out-stations, using both interferometric and Doppler methods. Similar measurements were made on the second satellite, and more recently kinetheodolite observations have been obtained. So far only preliminary estimates of the orbit parameters have been derived, but it is hoped that a more thorough analysis, particularly of the kinetheodolite data, will yield useful information on the effects of the earth's oblateness and of its atmosphere. ***E. G. C. Burt.*** *Royal Society, Proceedings,* v. 248, ser. A, Oct. 28, 1958, p. 48-55.

1193 Perturbations of the Orbit of a Satellite Near to the Earth. The main perturbations of a satellite orbit near the earth are those caused by the earth's oblateness and the atmosphere. Fortunately these two sources produce perturbations of quite different types, and as a first approximation they can be treated separately, though the cross-couplings would have to be evaluated in a thorough analysis of the subject. ***D. G. King-Hele.*** *Royal Society, Proceedings,* v. 248, ser. A, Oct. 28, 1958, p. 35-62.

1194 Direction-Finding Observations on the 20 Mc/s Transmissions From the Artificial Earth Satellites. Some direction finding, and associated radio observations on the artificial earth satellites are described. Samples of several bearing transits are presented and discussed in relation to possible ionospheric propagation modes. Reference is made to the occurrence of irregularities in bearing, signal strength and Doppler records, which might yield data on the ionosphere if detailed orbit information becomes available. ***F. A. Kitchen.*** *Royal Society, Proceedings,* v. 248, ser. A, Oct. 28, 1958, p. 63-68.

1195* Selection and Design of Escape Capsules. An analysis of the problems involved in selecting and designing an escape capsule for supersonic aircraft. Five capsules were studied, varying in size from the smallest capsule that could be put within the cockpit to the largest breakaway section of an aircraft that was considered feasible. ***Donald M. Root.*** *SAE Journal,* v. 66, Nov. 1958, p. 46-50.

1196* Plastics for Nose Cones. Plastics for nose cones and other parts of hypersonic vehicles are feasible because plastics decompose slowly. In this respect organic plastics may be more advantageous than metals. ***Irving Gruntfest.*** *SAE Journal,* v. 66, Nov. 1958, p. 72-73.

1197 Soviet Writings on Earth Satellites and Space Travel. Presents in English the discoveries of leading Soviet authorities in the field of artificial satellites and interplanetary travel and communications. It is illustrated with pictures and diagrams of the launching of the first, second, and third Sputniks, and includes the scientific results of these events. 253 pp. 1958. The Citadel Press, New York. (TL796 So89)

1198 How F-106 Was Flutter-Tested in Flight. There is only one final way to check for aeroelastic instability—do it in flight. Here is the technique Convair has used successfully in several flight test programs over the last four years. ***J. W. Redd.*** *Space/Aeronautics,* v. 30, no. 5, Nov. 1958, p. 72-77.

1199 Drag Due to a Lift of a Not-So-Slender Configuration—Application of Theory. An investigation into methods for reducing the supersonic drag due to lift carried out at the Cornell Aeronautical Laboratory with the aim of improving the supersonic performance of aircraft and missiles by minimizing the drag due to lift. A second-order theory was developed which allows for the prediction and minimization of the supersonic drag due to lift of rather nonslender wing-body combinations with straight trailing edges. Describes briefly the important aspects of the theory, as related to aircraft and missile design, and presents methods and procedures for applying the theoretical results. ***Robert J. Vidal.*** *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 57-316, pt. 2, Mar. 1958, 22 pp. (TL507 Un3.18w Vis.)

1200 Wind-Tunnel Investigation at Mach Numbers From 0.6 to 1.4 of Several Ejected Pilot-Seat Models. An investigation to determine the static longitudinal and lateral-directional aerodynamic characteristics of basic and modified versions of a conventional upward ejected pilot-seat combination, a sled-type upward ejected pilot-seat combination, and a downward ejected pilot-seat combination. Modifications to the basic models incorporated flow deflectors for pilot protection and drag reduction and various stabilizing devices. Angles of attack varied from −28° to +40°, and angles of side-slip from −16° to +12°. Reynolds numbers ranged from 0.9 million to 1.8 million based on the projected frontal height of the models. ***James L. Summers.*** *U. S. National Advisory Committee for Aeronautics, Research Memorandum, RM*-A58E02, Sept. 10, 1958, 47 pp. (TL782 Un3rm Vis.)

1201 Large-Scale Wind-Tunnel Tests of a Jet-Transport-Type Model With Leading- and Trailing-Edge High-Lift Devices. An investigation was conducted to determine the longitudinal characteristics of an airplane model with a 35° swept wing of aspect ratio 7 and four pylon-mounted nacelles. Several leading-edge configurations were studied in conjunction with double-slotted trailing-edge flaps. Three-component longitudinal data are presented. ***David H. Hickey and Kiyoshi Aoyagi.*** *U. S. National Advisory Committee for Aeronautics, Research Memorandum, RM*-A58H12, Sept. 26, 1958, 32 pp. (TL782 Un3rm Vis.)

1202 Wind-Tunnel Investigation of the Aerodynamic and Structural Deflection Characteristics of the Goodyear Inflatoplane. An investigation was conducted in the Langley full-scale tunnel over a range of test velocities from minimum stall speed up to speeds giving load factors for wing buckling. Tests were conducted over a range of speeds from approximately 41 to 70 mph with wing-guy-cable loads, wing-distortion photo-

graphs, and aerodynamic-force data recorded at each speed for a full range of angle of attack. ***Bennie W. Cocke, Jr.*** *U. S. National Advisory Committee for Aeronautics, Reseach Memorandum, RM*-L58E09, Sept. 10, 1958, 56 pp. (TL782 Un3rm Vis.)

1203 Hypersonic Viscous Flow Over Slender Cones. Viscous self-induced pressures on 3°-semivertex-angle cones were measured over the range 3.7 < free-stream Mach number < 5.8 and 0.5 < viscous-interaction parameter < 2.3. A new method for calculating self-induced pressures is presented which takes into account the interaction between boundary-layer growth and the inviscid-flow field at the outer edge of the boundary layer. Pressures calculated by this method were only 10 to 20% higher than the measured values. ***Lawrence Talbot, Toyoki Koga, and Pauline M. Sherman.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4327, Sept. 1958, 34 pp. (TL570 Un3t Vis.)

1204 Effect of Some External Crosswise Stiffeners on the Heat Transfer and Pressure Distribution on a Flat Plate at Mach Numbers of 0.77, 1.39, and 1.98. An experimental investigation on flat-plate models (50 inches long) with various arrangements of external stiffeners mounted normal to the direction of air flow. The tests were made under steady flow conditions in a free jet with Reynolds numbers of 3 x 10^6, 7 x 10^6, and 14 x 10^6, respectively, based on a length of 1 foot. ***Howard S. Carter.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4333, Sept. 1958, 21 pp. (TL570 Un3t Vis.)

1205 An Investigation of Some Phenomena Relating to Aural Detection of Airplanes. An investigation to determine the effect of modifications made in the propulsion system of a single-engine airplane to substantially reduce its external noise and, thereby, to evaluate the significance of the external noise level of an airplane with regard to the problem of its detection by ground observers. Conventional noise-level measurements consisting of broad- and narrow-band frequency analyses were made for static tests on the ground. Also, listening data with the aid of ground observers were obtained for cruise flights as well as for take-offs, landings, and power-off glides. ***Harvey H. Hubbard and Domenic J. Maglieri.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4337, Sept. 1958, 49 pp. (TL570 Un3t Vis.)

1206 Tables and Graphs of Normal-Shock Parameters at Hypersonic Mach Numbers and Selected Altitudes. Data are presented for real air in thermal and chemical equilibrium at conditions ahead of the shock corresponding to six selected altitudes, and for temperatures behind the shock from 2,000 to 11,000 K. The altitudes used are those representing the boundaries of the isothermal layers in that part of the earth's atmosphere considered applicable to aerodynamic flight; that is, below an altitude of 300,000 feet. ***Paul W. Huber.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4352, Sept. 1958, 26 pp. (TL570 Un3t Vis.)

1207 Large-Scale Wind-Tunnel Tests of an Airplane Model an Unswept, Aspect-Ratio-10 Wing, Two Propellers, and Area-Suction Flaps. An investigation to determine the effects of a propeller slipstream on the lift obtainable and the flow requirements for suction applied to the porous area of a trailing-edge flap on a model of a twin-engine airplane having a high-aspect-ratio, thick, straight wing. Comparisons with the results of tests on the same model but having a combination slot suction and blowing boundary-layer-control system (Arado) on the trailing-edge flaps and ailerons indicated considerably lower suction flow requirements for the area-suction flaps. ***James A. Weiberg, Roy N. Griffin, Jr., and George L. Florman.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4365, Sept. 1958, 76 pp. (TL570 Un3t Vis.)

1208 Wind-Tunnel Tests of a Full-Scale Helicopter Rotor With Symmetrical and With Cambered Blade Sections at Advance Ratios From 0.3 to 0.4. Tests of a 44-foot-diameter, three-bladed helicopter rotor for the purpose of investigating the performance gains made available by delaying retreating blade stall by the use of blade sections with increased maximum lift. Marked changes in rotor-torque and blade pitching-moment characteristics afforded two means of defining stall boundaries of the rotor. ***John L. McCloud and George B. McCullough.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4367, Sept. 1958, 33 pp. (TL570 Un3t Vis.)

1209 Use of the Coanda Effect for Jet Deflection and Vertical Lift With Multiple-Flat-Plate and Curved-Plate Deflection Surfaces. The ratio of lift and axial thrust to undeflected thrust of nozzle-deflection-plate configurations using the Coanda effect for obtaining jet deflection and lift were evaluated from force measurements. Pressure distributions were also obtained over the surfaces of the deflection plates. ***Uwe H. von Glahn.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4377, Sept. 1958, 54 pp. (TL570 Un3t Vis.)

1210 Approximate Method for Calculation of Laminar Boundary Layer With Heat Transfer on a Cone at Large Angle of Attack in Supersonic Flow. By the use of an integral technique, the laminar boundary-layer equations are reduced on the windward generator of the plane of symmetry to a set of simultaneous algebraic equations. The Chapman-Rubesin temperature-viscosity relation and a Prandtl number of 1 are assumed. The method enables the skin friction coefficients and Stanton number to be calculated in a much shorter time than was needed to obtain exact numerical solutions from the boundary-layer equations. ***William E. Brunk.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4380, Sept. 1958, 26 pp. (TL570 Un3t Vis.)

1211 Static Longitudinal and Lateral Stability Characteristics at Low Speed of 60° Sweptback-Midwing Models Having Wings With an Aspect Ratio of 2, 4, or 6. A systematic investigation in the Langley stability tunnel. Although both static longitudinal and lateral stability data are presented, emphasis is placed on the contribution of the various components and combinations of components to directional stability at high angles of attack. Also included are some comparisons with the directional stability characteristics of similar unswept- and 45° sweptback-wing configurations. ***Walter D. Wolhart and David F. Thomas, Jr.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4397, Sept. 1958, 41 pp. (TL570 Un3t Vis.)

1212 Measurements of Ground-Reaction Forces and Vertical Center-of-Gravity Accelerations of a Bomber Airplane Taxiing Over Obstacles. An investigation was made on an unswept-wing four-engine bomber airplane to determine the vertical and drag ground-reaction forces imposed on the landing gear when taxiing over obstacles 1.5 and 3.0 inches in height and 1, 2, and 4 feet in width. Vertical accelerations at the center of gravity of the airplane and shock-strut displacement were also measured. Results are presented of the effects of ground speed and the widths and heights of the obstacles on the vertical and drag forces, on vertical acceleration at the center of gravity of the airplane, on shock-strut displacement, and on response of the upper mass of the airplane structure. ***James M. McKay, Richard H. Sawyer, and Albert W. Hall.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4400, Sept. 1958, 30 pp. (TL570 Un3t Vis.)

1213 Hydrodynamic Impact Loads on 30° and 60° V-Step Plan-Form Models With and Without Dead Rise. Loads were investigated at the Langley impact basin. The investigation consisted of a series of fixed-trim impacts in smooth water with a dead-rise model having a round keel and chine flare and a beam-loading coefficient of 3.6. ***Philip M. Edge, Jr. and Jean P. Mason.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4401, Sept. 1958, 20 pp. (TL570 Un3t Vis.)

1214 Effects of Propeller Position and Overlap on the Slipstream Deflection Characteristics of a Wing-Propeller Configuration Equipped With a Sliding and Fowler Flap. An investigation made in a static-test facility at the Langley Aeronautical Laboratory. The effects of a leading-edge slat, nacelle size, flap segmentation, and number of propellers were also investigated. ***William C. Hayes, Jr., Richard E. Kuhn, and Irving R. Sherman.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4404, Sept. 1958, 81 pp. (TL570 Un3t Vis.)

1215* Variational Approach to the Stratospheric Cruise of a Turbo-Jet Powered Aircraft. The cruise performance of a turbo-jet powered aircraft traveling in the stratosphere is investigated. ***Angelo Miele.*** *Zeitschrift für Flugwissenschaften,* v. 6, Sept. 1958, p. 253-257.

1216* Missile Detection by Means of Very Wide Range Radar. (*In German.*) Raketenerfassung mittels Weitestradar. ***Karl Röhrich.*** *Zeitschrift für Flugwissenschaften,* v. 6, Sept. 1958, p. 266-271.

1217* Theory of Aircraft Structural Analysis. Modern matrix methods for the analysis of structures are described. The basic theory is developed on an algebraic model. In this model algebraic representation of the basic structure elements and of their connections enter as axioms. A certain reciprocity relation called "cotransference" is developed and used as a basic tool to replace classical energetic concepts. ***B. Langefors.*** *Zeitschrift für Flugwissenschaften,* v. 6, Oct. 1958, p. 281-291.

See also: **1682** (rocket propulsion requirements for satellites); **1687** (flow in axial compressor); **1691** (high-temperature devices for engine control); **1711** (space science literature); **1762** (thermal stresses in structures); **1934** (manufacture of Rotodyne rotorblade); **2093** (aircraft nuclear propulsion system); **2344** (missile fastener specifications).

AGRICULTURE

1218 How Intense Rainfall Affects Runoff and Soil Erosion. Erosibility of intense storms may be determined with acceptable degree of accuracy by studying easily measured rainfall characteristics. ***Aurelius P. Barnett.*** *Agricultural Engineering,* v. 39, Nov. 1958, p. 703 + 5 pages.

1219* Chromosomal Analyses of the Genetic Factors for Resistance to DDT in Two Resistant Lines of *Drosophila melanogaster*. Analysis of two resistant lines showed that factors for resistance were located on each of three chromosomes and that their apportionment among the three was not the same in the two lines. ***James C. King and Lauritz Sømme.*** *Genetics,* v. 43, no. 4, July 1958, p. 577-593.

1220* Influence of Antibiotics on the Growth and Protein Metabolism of Young Dairy Calves. Antibiotics had little effect on over-all digestion and protein metabolism of the calf, suggesting that the mode of action in stimulating the growth of calves does not appear to be through an effect on protein metabolism or on digestibility. ***C. A. Lassiter, R. M. Grimes, and C. W. Duncan.*** *Journal of Dairy Sciences,* v. 41, Oct. 1958, p. 1417-1424.

1221* Use of High-Nitrogen Feedstuff Made From Whey in the Rations of Dairy Animals. ***D. G. Hazzard, E. M. Kesler, D. R. Arnott, and Stuart Patton.*** *Journal of Dairy Science,* v. 41, Oct. 1958, p. 1439-1445.

1222* Increase in Fitness in Experimental Populations Resulting From Heterosis. Introduction of a single set of haploid autosomes into an experimental population equilibrated by natural selection resulted in an approximately threefold rise in the collective size and production of the population. The biomass of the experimental populations transgressed also the level maintained by that control population which was used as a donor of the introduced wild-type chromosomes. Natural selection appears not only to prevent the breakdown of the immediate heterosis but also to maintain it through favoring the development of balanced polymorphism. ***Hampton L. Carson.*** *National Academy of Sciences, Proceedings,* v. 44, Nov. 1958, p. 1136-1141.

1223 Variations in the Insecticide Tolerance of Insects. ***D. Spiller.*** *Nature,* v. 182, Oct. 25, 1958, p. 1177.

1224* Effect on Honey Bees of Some Defoliants. Two commonly used commercial defoliants, a mixture of 50% dinitro-ortho-secondary-butyl-phenol (DNBP) plus 10% dinitro-ortho-secondary-amyl-phenol (DNAP) and a 40% soluton of pentachloro-phenol (PCP) were highly toxic to bees. ***T. Palmer-Jones and I. W. Forster.*** *New Zealand Journal of Agricultural Research,* v. 1, no. 5, Oct. 1958, p. 620-626.

1225 Biological Control Using Ladybirds. ***J. B. Kemmerer.*** *World Crops,* v. 10, Nov. 1958, p. 411-412.

See also: **1621** (pesticide residues in foodstuffs).

BIOCHEMISTRY AND BIOPHYSICS

1226* Effect of Heterologous Transplantation on Chromosomes of Ascites Tumours. ***Ulla Ising.*** *Acta Pathologica et Microbiologica Scandinavica, Supplementum* 127, 1958, 102 pp. + 2 plates.

1227* The Morphology of the Human Sperm. Electron Microscopic Investigations of the Ultrastructure. ***J. Schultz-Larsen.*** *Acta Pathologica et Microbiologica Scandinavica, Supplementum* 128, 1958, 121 pp.

1228* Variation in the Sex Ratio in Mice, as a Possible Result of γ-Irradiation of Embryos. (*In Russian.*) Izmenenie chislennogo sootnosheniia polov u mysheĭ kak vozmozhnyĭ rezul'tat γ-obliucheniia embrionov. ***F. B. Shapiro and N. I. Shapiro.*** *Akademiia Nauk SSSR, Doklady,* v. 122, no. 2, Sept. 11, 1958, p. 215-218.

1229* On the Albumin of Peripheral Nerves. (*In Russian.*) Ob al'bumine periphericheskikh nervov. ***N. M. Poliakova and K. S. Kabak.*** *Akademiia Nauk SSSR, Doklady,* v. 122, no. 2, Sept. 11, 1958, p. 275-277.

1230* Radioactivity and the Human Skelton. Janeway Lecture, 1958. ***L. D. Marinelli.*** *American Journal of Roentgenology, Radium Therapy and Nuclear Medicine,* v. 80, Nov. 1958, p. 729-739.

1231 Medical Considerations of Exposure to Microwaves. . . . show no cause for public concern about the effects of greatly attenuated microwave energy in the environment. ***Charles I. Barron and Albert A. Baraff.*** *American Medical Association, Journal,* v. 168, no. 9, Nov. 1, 1958, p. 1194-1199.

1232* The Effect of Fixed Combinations of Antibiotics on Staphylococci *In Vitro*. ***S. Fűrész, O. Zangaglia, and R. Scotti.*** *Antibiotics & Chemotherapy,* v. 8, Nov. 1958, p. 571-575.

1233* A Method of Primary Selection of *Actinomyces*, Cancer Cell Antagonists. Agar blocks on cellophane plates from cultured *Actinomyces* were used as native antibiotics. (*In Russian.*) Metod pervichnogo otbora aktinomitsetov - antagonistov protiv rakovykh kletok. ***A. I. Koreniako and N. D. Kofanova.*** *Antibiotiki,* v. 3, no. 5, Sept.-Oct. 1958, p. 5-8.

1234* The Inactivating Action of Certain New Antibiotics From the Actinomyces Group on Actinophages *in Vitro* and *in Vivo*. Describes action of three antibiotics on five actinophages. All antibiotics possessed a different spectrum and character of the antiphage effect. Cerullomycin suppressed the growth of four of the five actinophages only *in vivo*, whereas *in vitro* it was inactive. (*In Russian.*) Ob inaktiviruiushchem deistvii nekotorykh novykh antibiotikov aktinomitsetnogo proiskhozdeniia na oktinofagi *in vitro* i *in vivo*. ***G. V. Kochetkova, O. L. Popova, T. S. Bobkova, and E. G. Toropova.*** *Antibiotiki,* v. 3, no. 5, Sept.-Oct. 1958, p. 17-21.

1235* Inhibition of Lysine Utilization in Bacteria by S-(β-Aminoethyl)cysteine and Its Reversal by Lysine Peptides. ***T. Shiota, J. E. Folk, and F. Tietze.*** *Archives of Biochemistry and Biophysics,* v. 77, no. 2, Oct. 1958, p. 372-377.

1236* Immunbiological Prophylaxis and Therapy of the Acute Radiation Syndrome. The mechanism can be compared with an antitoxic immunization directed against the toxic degradation products of macromolecules originating from radiation. There is a possibility that suitable vaccines can be ob-

tained for this purpose through antolysis or hydrolysis of homologous blood. It appears to be necessary that these degradation products are completed to full antigen before being used for active immunization or for obtaining antibody serums. (*In German.*) Immunbiologische Prophylaxe und Therapie des akuten Strahlensyndroms. ***K. Theurer.*** *Atompraxis*, v. 4, no. 9, 1958, p. 327-330.

1237* Studies on Submicroscopic Structure of Leukemias of Known or Suspected Viral Origin: a Review. *Leon Dmochowski and Clifford E. Grey.* *Blood*, v. 13, Nov. 1958, p. 1017-1042.

1238 Bone and Radiostrontium. Reviews recent work on the physiology and structure of the skeleton with special respect to the accumulation of radioactive Sr. Covers the metabolism of Sr, the distribution of mineral salts in the skeleton and the molecular structure of the inorganic phase in bone, and describes experiments performed with radioactive Sr in animals. Estimates the permissible total body burden of radioactive Sr in human beings. ***Arne Engström, Rolf Björnerstedt, Carl-Johan Clemedson, and Arne Nelson.*** 139 pp. 1957, John Wiley & Sons, New York. (QH652 En37b)

1239* Nulear Control of Enzyme Synthesis in *Acetabularia*. The effect of enucleation on the synthesis of two enzymes, invertase and acid phosphatase, is described. ***Konrad Keck and Heinz Clauss.*** *Botanical Gazette*, v. 120, no. 1, Sept. 1958, p. 43-49.

1240* Recent Advances in the Study of Chromosome Structure. A critical appraisal, of the principal literature only, on the chemical nature of chromosomes, and their physical constitution. ***Arun Kumar Sharma and Archana Sharma.*** *Botanical Review*, v. 24, nos. 8-10, Oct.-Dec. 1958, p. 511-549.

1241* Effect of Interferon on the Growth of Viruses on the Chick Chorion. Interferon inoculated on the chick chorion *in ovo* diffused through to the neighboring allantoic cells and interfered with their ability to support the growth of influenza virus *in vitro*. The same dose of interferon greatly inhibited the development of pocks and hamagglutinin by vaccinia, but did not significantly interfere with pock development by herpes simplex virus. Cow-pox and ectromelia were inhibited to about the same extent as vaccinia virus. ***A. Isaacs, D. C. Burke, and Lydia Fadeeva.*** *British Journal of Experimental Pathology*, v. 39, no. 5, Oct. 1958, p. 447-451.

1242* Some Factors Affecting the Production of Interferon. There was a correspondence between the interfering activity of a preparation and its ability to produce interferon. Live influenza virus did not produce interferon in the first 24 hr. incubation, i.e., during the period of peak virus multiplication. Interferon was produced by incubating chick chorioallantoic membranes with irradiated influenza B, fowl plague and Newcastle disease viruses, and in small amounts, by irradiated influenza A virus incubated with monkey kidney and HeLa cells. ***D. C. Burke and A. Isaacs.*** *British Journal of Experimental Pathology*, v. 39, no. 5, Oct. 1958, p. 452-458.

1243* The Interaction of Carcinogenic Hydrocarbons With Tissues. V. Some Structural Requirements for Binding of 1,2,5,6-Dibenzanthracene. *Vincent T. Oliverio and Charles Heidelberger.* *Cancer Research*, v. 18, no. 9, Oct. 1958, p. 1094-1104 + 1 plate.

1244* Microbial Oxidation of Steroids in 12- and 15-Position. Description of the reaction of compounds with *Calonectria decora*. (*In German.*) Mikrobielle Oxydation von Steroiden in 12- und 15-Stellung. ***Alfred Schubert and Rudolf Siebert.*** *Chemische Berichte*, v. 91, no. 9, 1958, p. 1856-1860.

1245* Evolution of Substructures of Mitochondria During Cellular Differentiation. The surface of the internal membranes (tubules and crests) increases, going through a maximum when the photosynthesizing cells seem to be most active, and decreases in the cells where starch has accumulated. (*In French.*) Évolution des infrastructures de mitochondries au cours de la différenciation cellulaire. ***Roger Buvat and Arlette Lance.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 247, no. 15, Oct. 13, 1958, p. 1130-1132 + 4 plates.

1246* Effects of Ribonuclease and of Deoxyribonuclease on the West Nile Virus. The infectious capacity is increased by ribonuclease. (*In French.*) Action de la ribonucléase et de la désoxyribonucléase sur le virus West Nile. ***Jean Lavillaureix.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 247, no. 15, Oct. 13, 1958, p. 1148-1150.

1247* Sister Chromatid Exchanges in Tritium-Labeled Chromosomes. Tritium-labeled chromosomes of *Bellevalia* are shown to be two-stranded before duplication. Among 204 second metaphase chromosomes examined, there were 81 twin exchanges and 30 single exchanges. This frequency can be explained only on the hypothesis that the two strands of the chromosome are unlike, i.e., are not free to reunite at random. Therefore, the chromosome has two features in common with the Watson-Crick model of DNA. It has two strands and the strands are different in some structural feature that restricts reunion to like strands when chromatid exchanges occur. ***J. Herbert Taylor.*** *Genetics*, v. 43, no. 4, July 1958, p. 515-529.

1248* The Part Played by Micro-Organisms in Certain Corrosion Phenomena. Shows that the corrosion phenomena, in which micro-organisms play a part, are connected with the general electrochemical theory of corrosion. Describes the various kinds of bacteria which can induce the corrosion of ferrous and non-ferrous metals and explains their action. The various means of protection against such biologic corrosion are enumerated. (*In French.*) Le rôle des micro-organismes dans certains phénomènes de corrosion. ***Lucien Baudon.*** *Industrie Chimique Belge*, v. 23, Sept. 1958, p. 983-990.

1249 Investigations of the Electronic Structure of Aromatic Cancerigenic Amines. II. The Ortho-Hydroxylation Mechanism. Correlations were found between orthohydroxylation of aromatic amines and the electronic indices of ortho carbons, as well as the electronic indices linking the orthocarbon and carbon carrier of the amine function. (*In French.*) Recherches sur la structure électronique des amines aromatiques cancérogènes. II. Sur le mécanisme de l'*ortho*-hydroxylation. ***Bernard Pullman and Ginette Tarrago.*** *Journal de Chimie Physique*, v. 55, nos. 7-8, July-Aug. 1958, p. 502-509.

1250 Effect of Antiphage Serum on the Virulence of *Corynebacterium diphtheriae*. *In vitro* conversion takes place during serial passage of a toxigenic strain in broth containing antiphage serum, and *in vivo* conversion occurs as phage antibodies are developed in the infected animal. ***Paul S. Anderson, Jr. and Philip B. Cowles.*** *Journal of Bacteriology*, v. 76, no. 3, Sept. 1958, p. 272-280.

1251 Selection of Bacterial Mutants Which Excrete Antagonists of Antimetabolites. *Edward A. Adelberg.* *Journal of Bacteriology*, v. 76, no. 3, Sept. 1958, p. 326.

1252* Role of the Ribonucleoprotein Particle in Protein Synthesis and the Effects of Growth Hormone. The incorporation of labeled glycine, adenine, and methionine into the microsomal ribonucleoprotein particles of rat liver and into supernatant and serum proteins suggests that there is not necessarily a simultaneous synthesis of the total protein and nucleic acid of the ribonucleoprotein particle. ***M. Earl Balis, Kumud D. Samarth, Mary G. Hamilton, and Mary L. Petermann.*** *Journal of Biological Chemistry*, v. 233, no. 5, Nov. 1958, p. 1152-1155.

1253* A Cytochemical Study of the Sulfhydryl Groups of Sea Urchin Eggs During the First Cleavage. Changes in the distribution of protein-bound SH groups from fertilization to the 2 cell stage were studied cytochemically by use of a mercaptide-forming azo dye. The color intensity in the cytoplasm increased upon fertilization. The astral centers and spindle during mitosis were stained deeply. ***Naoko Kawamura and Katsuma Dan.*** *Journal of Biophysical and Biochemical Cytology*, v. 4, no. 5, Sept. 1958, p. 615-619 + 3 plates.

1254* The Relation Between the Axial Complex of Meiotic Prophase Chromosomes and Chromosome Pairing in a Salamander. (*Plethodon cinereus*). In the stages studied, homologous chromosomes were not always completely paired. The lateral elements of the complex separate and follow the single chromosome axes at these points. The central element disappears and thus may be a phenomenon of pairing. It is con-

cluded that the lateral elements of the synaptinemal complex may more correctly be a "core" of the single meiotic prophase chromosome, possibly being concerned with its linear organization. ***Montrose J. Moses.*** *Journal of Biophysical and Biochemical Cytology*, v. 4, no. 5, Sept. 1958, p. 633-638 + 3 plates.

1255* The Cation Content of Phospholipides From Swine Erythrocytes. Phospholipides from swine erythrocytes were isolated and separated into four reproducible fractions. One of the fractions seems to be pure phosphatidylserine. All fractions contained Na^+ and K^+, but very little Ca^{++}. There appear to be reasons to believe that the entire system of phospholipides binds Na^+ preferentially. ***Leonard B. Kirschner.*** *Journal of General Physiology*, v. 42, no. 2, Nov. 1958, p. 231-241.

1256 Physiologically Active Compounds. II. Hydrochlorides of Aminoesters of Substituted Benzilic and Glycolic Acids. Two of the synthesized compounds appear to be more active in experimental animals than atropine in preventing mortality from an anticholinesterase compound and four of them exhibit the highest anticholinergic activity. ***C. A. Buehler, H. A. Smith, D. M. Glenn, and K. V. Nayak.*** *Journal of Organic Chemistry*, v. 23, Oct. 1958, p. 1432-1437.

1257* The Redistribution of Nucleic Acid and the Appearance of Specific Antigen in Hela Cells Infected With Herpes Virus. Infected cells show a complete breakdown of particulate nuclear deoxyribonucleic acid (DNA) and a deposition of much diffuse DNA near the nuclear membrane. DNA appears before viral antigen can be detected; in successive stages more and more diffuse DNA becomes associated with viral antigen, suggesting that accumulation of diffuse DNA is a necessary step in the synthesis of viral antigen. These changes are associated with the formation of large giant-cells, probably formed by fusion and contraction of infected individual cells and, to a much less extent, by nuclear division in undivided cells. ***R. W. Ross and Eva Orlans.*** *Journal of Pathology and Bacteriology*, v. 76, no. 2, Oct. 1958, p. 393-402 + 5 plates.

1258 Medicine and Chemistry. v. VI. Reports of the Medical-Chemical Research Institutes of Farbwerke Hoechst AG. in Frankfort on the Main dealing with pharmaceutical research on oral antidiabetics, synthetic hormones, antibiotics, local anaesthetics, vaccines, and insecticides. (*In German.*) Medizin und Chemie. 591 pp., 1958. Verlag Chemie, GMBH. Weinheim/Bergstr. (RS402 M46.9)

1259* Linear Analysis of Tobacco Mosaic Virus. Results show that the technique of linear decomposition of TMV yields useful data regarding the relations between the biological activity and structure of the virus. Data suggest that the biological competence of TMV is associated with approximately a single turn of the helix formed by the virus RNA, provided that this section of the RNA fiber is bound to the surface of the underlying protein subunits. ***Barry Commoner, Georgia B. Shearer, and Clarice Strode.*** *National Academy of Sciences, Proceedings*, v. 44, Nov. 1958, p. 1117-1122.

1260 Further Observations on Tumour-Enhancing Factors: Their Bearing on the Immunological Theory of Cancer. ***H. N. Green and R. Wilson.*** *Nature*, v. 182, Oct. 18, 1958, p. 1054-1058.

1261 Inhibition and Excitation Due to Gamma-Aminobutyric Acid in the Central Nervous System. The excitatory mediator of higher animals is produced by cerebral tissue from γ-aminobutyric acid as substrate, through methylation by coenzyme, vitamin B_{12} or folic acid. The process of conversion of γ-aminobutyric acid into the excitatory mediator requires energy which is supplied by a reaction involving thiamine. ***Takahis Hayashi.*** *Nature*, v. 182, Oct. 18, 1958, p. 1076-1077.

1262 Anti-Tumour and Biochemical Effects of Purified Bovine Xanthine Oxidase in C3H and C Mice. ***A. Haddow, et al.*** *Nature*, v. 182, Oct. 25, 1958, p. 1144-1146.

1263 Selection of Cell Lines in Tissue Culture by the Use of Cytotoxic Antisera. Two sublines from human amnion can be distinguished on the basis of their morphological characteristics, their capacity to support virus multiplication, and their sensitivity to the HeLa and MCN antisera. ***V. Defendi, A. A. Kamrin, and J. S. Colter.*** *Nature*, v. 182, Nov. 1, 1958, p. 1246 + 2 pages.

1264* Phosphatase Formation in Penicillin Resistant and Penicillin Sensitive Staphylococci. Formation of phosphatases is much decreased in penicillin resistant forms obtained *in vitro*, whereas, in penicillin resistant staphylococci isolated from pathological processes, this process is not influenced. (*In German.*) Phosphatasebildung bei den penicillinresistenten und penicillinempfindlichen Staphylokokken. ***K. I. Markov, G. K. Saev, S. Klein, and A. Monov.*** *Naturwissenschaften*, v. 45, no. 18, Sept. 1958, p. 443-444.

1265* Detecting Cancerogenous Hydrocarbons in Tobacco Smoke. In 288 chromatographical fractions of a neutral smoke condensate obtained from mechanically produced cigarette smoke, with normal glowing temperature between 720 and 740 C, a number of polycyclic hydrocarbons were found by means of UV fluorescence, including anthracene, perylene, fluoranthene, chrysene, pyrene, phenanthrene, and 3,4 benzpyrene. (*In German.*) Zum Nackweis von cancerogenen Kohlenwasserstoffen im Tabakrauch. ***A. Pietzsch.*** *Naturwissenschaften*, v. 45, no. 18, Sept. 1958, p. 445.

1266 Radiation Biology and Medicine. Summarizes the history of the application of radiation to experimental biology and to medical diagnosis and therapy, and discusses the influence of atomic energy on growth and aging, ecology, meteorology, oceanography, and bioeconomics. Covers basic mechanisms, mutational effects, mathematical biology, radiation safety, instrumentation, and dosimetry. ***Walter D. Claus, editor.*** 944 pp. 1958. Addison-Wesley Publishing Co., Reading, Mass. (QH652 C57r)

1267 Genetic and Somatic Effects of Carbon-14. This by-product of nuclear-weapon testing may do more genetic and somatic damage than has been supposed. ***Linus Pauling.*** *Science*, v. 128, Nov. 14, 1958, p. 1183-1186.

1268 Property of Cerebrospinal Fluid Associated With Disturbed Metabolism of Central Nervous System. Cerebrospinal fluid was assayed for the capacity to contract smooth muscle and for the capacity to develop such activity when incubated with globulin. Activity was observed in fluid collected from patients with inflammatory or degenerative disease of the central nervous system, sustained intracranial vasodilatation, sustained noxious stimulation, or chronic schizophrenia. Control specimens lacked measurable activity. ***Loring F. Chapman and Harold G. Wolff.*** *Science*, v. 128, Nov. 14, 1958, p. 1208-1209.

1269 Thermal Copolymerization of Amino Acids to a Product Resembling Protein. ***Sidney W. Fox and Kaoru Harada.*** *Science*, v. 128, Nov. 14, 1958, p. 1214.

1270* Induction of Tumors by a Virus-Like Agent(s) Released by Tissue Culture. This report confirms and extends, by using inbred strains of mice, rats, and hamsters, the recent observations of Stewart and Eddy relative to induction of multiple types of cancers in hamsters(9), mice(7,8), and rats(10) with a virus-like agent derived from a mouse tumor propagated in mouse embryo tissue culture. ***Edwin A. Mirand, et al.*** *Society for Experimental Biology and Medicine, Proceedings*, v. 99, no. 1, Oct. 1958, p. 1-5.

1271* Studies on the Anemia of Tumor-Bearing Animals. I. Distribution of Radioiron Following the Injection of Labeled Erythrocytes. In rats bearing certain transplanted tumors, the tumors contained large amounts of iron, frequently exceeding the total amount of iron found in the liver. Following the intravenous injection of Fe^{59}-labeled red cells into normal and tumor-bearing rats and mice, the Fe^{59} concentration decreased at a more rapid rate in the tumor-bearing animals. ***Robert E. Greenfield, Jamie E. Godfrey, and Vincent E. Price.*** *U. S. National Cancer Institute, Journal*, v. 21, no. 4, Oct. 1958, p. 641-656.

1272* Inactivation of the Endotoxic Activity of Bacterial Lipopolysaccharides in Horse Serum, Plasma and Full Blood. Endotoxic, highly purified lipopolysaccharides of *Sal-*

monella abortus equi and *Salmonella paratyphi B* were inactivated in 12 to 24 hr. by horse serum or plasma at 37 C, but not at 4 C. (*In German.*) Die Inaktivierung der endotoxischen Wirksamkeit bakterieller Lipopolysaccharide in Serum, Plasma und Vollblut vom Pfred. ***O. Lüderitz, D. Hammer, F. Goebel, K. Sievers, and O. Westphal.*** *Zeitschrift für Naturforschung*, v. 13b, Sept. 1958, p. 566-571.

See also: **1222** (heterosis in *Drosophila*); **1592** (intestinal radio transmitter).

CERAMICS AND CONCRETE

1273 The Unit-Control Burning System. Discusses advantages this system offers by maintaining very close temperature control throughout the fired load in the kiln. ***David M. Pixley, Dean Tinker, and Francis V. Pixley.*** *American Ceramic Society Bulletin*, v. 37, Nov. 1958, p. 468-470.

1274 Fabrication of Uranium Dioxide Fuel Element Shapes by Hydrostatic Pressing. Hydrostatic pressing equipment and techniques are described for fabricating uranium dioxide fuel element shapes such as rods, tubes, rings, and spheres. Shapes pressed starting with the powder possessed a minimum of density gradients, no pressure cracks, mechanical stability, low firing shrinkage, high green and sintered densities. Compaction ratios on pressing were 1.8 to 1. Hydrostatic repressing of preformed shapes decreased firing shrinkage 1-4%, increased green densities 7-10%, and increased sintered densities 2-6%. ***H. W. Newkirk, Jr. and R. J. Anicetti.*** *American Ceramic Society Bulletin*, v. 37, Nov. 1958, p. 471-475.

1275 Some Causes and Effects of Phases Other Than Tetragonal $BaTiO_3$ in Barium Titanate. To eliminate variations in purity as one cause of variable properties, mixtures were made from one lot of $BaCO_3$ combined with a single lot of TiO_2. In a systematic study of mixing methods it was found that wet ball milling gave the most reliable, reproducible results. An X-ray diffraction study revealed that the satisfactory powders prepared by this method consisted essentially of tetragonal $BaTiO_3$,without detectable amounts of other phases. Hexagonal $BaTiO_3$ was detected in a few of the unsatisfactory samples, but one of the predominant by-products which resulted from poor mixing of the reagents was Ba_2TiO_4. ***John F. Murray.*** *American Ceramic Society Bulletin*, v. 37, Nov. 1958, p. 476-479.

1276 Use of Titanium Dioxide in Self-Opacifying Glazes. White opaque glazes in which opacification is obtained by the crystallization of titanium dioxide from a clear glass during firing have been developed. The opacifying phase may be controlled to yield either anatase or rutile. A high firing temperature or the presence of components which increase the fluidity favors the formation of rutile. The presence of alumina appears to be required if a good white color is to be obtained. ***K. H. Styhr, Jr. and M. D. Beals.*** *American Ceramic Society Bulletin*, v. 37, Nov. 1958, p. 480-485.

1277 A High Temperature Recording Dilatometer. The application of automatic recording equipment for dilatation studies up to 1300 C is discussed. A function plotter measures the difference in e.m.f.'s generated by two photovoltaic cells, one of which is exposed directly to a light source while the other has between it and the light source a shield whose movement is brought about by specimen dilatation. The dilatation curve is plotted automatically as a function of specimen temperature. Data are presented for the thermal expansion of some ceramic materials. ***R. J. Beals and J. H. Lauchner.*** *American Ceramic Society Bulletin*, v. 37, Nov. 1958, p. 486-488.

1278 Temperature Dependence of Strength and Brittleness of Some Quartz Structures. Study of the microhardness of the quartz structures of SiO_2 and the isomorphous compounds $AlPO_4$, GeO_2, and $LiAlSiO_4$. ***J. H. Westbrook.*** *American Ceramic Society, Journal*, v. 41, Nov. 1958, pt. 1, p. 433-440.

1279 Effect of Water on Mechanical Strength of Selected Ceramic Compositions. The presence of water, in the air or in a coating, was found to decrease the strength of unglazed porcelain test bars. ***W. J. Smothers.*** *American Ceramic Society, Journal*, v. 41, Nov. 1958, pt. 1, p. 440-444.

1280 Phase Equilibria in the System CaO-Iron Oxide in Air and at 1 Atm. O_2 Pressure. Phase equilibrium data, obtained by the quenching technique, are presented for mixtures in the iron oxide-rich part of the system CaO-iron oxide. Present data are combined with data available in the literature to construct phase diagrams comprising the region from liquidus temperatures to temperatures slightly below the solidus. ***Bert Phillips and Arnulf Muan.*** *American Ceramic Society, Journal*, v. 41, Nov. 1958, pt. 1, p. 445-454.

1281 Note on Calculation of Effect of Temperature and Composition on Specific Heat of Glass. The specific heats of glasses reported in the literature since 1951 were studied in relation to the Sharp-Ginther equation. ***John Moore and D. E. Sharp.*** *American Ceramic Society, Journal*, v. 41, Nov. 1958, pt. 1, p. 461-463.

1282 Dielectric Loss and the States of Glass. Irreversible changes in dielectric loss occur in annealed plate glass as a result of heat treatments at temperatures below the transformation range. ***D. W. Rinehart.*** *American Ceramic Society, Journal*, v. 41, Nov. 1958, pt. 1, p. 470-475.

1283 High-Temperature-Resistant Ceramic Adhesives. Ceramic adhesives were developed for bonding metal in the operational range 500 to 1000 F. ***Henry G. Lefort and Dwight G. Bennett.*** *American Ceramic Society, Journal*, v. 41, Nov. 1958, pt. 1, p. 476-482.

1284 Piezoelectric Ceramics. In addition to a survey of the field, presents new data on lead titanate zirconate over a range of compositions. ***Hans Jaffe.*** *American Ceramic Society, Journal*, v. 41, Nov. 1958, pt. 2, p. 494-498.

1285 Ceramic Electrical Insulating Materials. During the past 30 years, the principal ceramic insulating materials have been the electrical porcelains, the steatites, and the high alumina bodies. The compositions, the structures, and the properties of these materials are discussed. Predictions of future trends in ceramic insulating materials are made. ***M. D. Rigterink.*** *American Ceramic Society, Journal*, v. 41, Nov. 1958, pt. 2, p. 501-506.

1286* Influence of Water-Cement Ratio on Mortar in Which Shrinkage Is Restrained. A study on the stress and strain conditions at the instant of cracking for small bars of cement mortar whose shrinkage was restrained from an early age by a centrally placed steel rod. Shows that cracking probably starts as a definite elastic strain in the cement paste phase of the mortar. Also reports on the creep and shrinkage of mortars. ***F. A. Blakey.*** *American Concrete Institute, Journal*, v. 30, no. 5, Nov. 1958; *ACI Proceedings*, v. 55, 1958, p. 591-604.

1287* Lightweight Concrete Made With Expanded Blast Furnace Slag. Data on both insulating and structural concretes made with typical expanded slag aggregates. The test data provide information on strength, durability, heat transmission, and unit weight of concretes made with various cement contents and amounts of entrained air. The effects of different aggregate top sizes and of various natural sand substitutions for the fine aggregate are discussed. ***D. W. Lewis.*** *American Concrete Institute, Journal*, v. 30, no. 5, Nov. 1958; *ACI Proceedings*, v. 55, 1958, p. 619-633.

1288 Some General Considerations on Thermal Shock. The factors on which the thermal shock resistance of brittle materials depend are discussed and the basis of the quantitative treatment of thermal shock behavior is indicated. Complications arise in the treatment because of the variation with temperature of the material properties involved and also because there appears to be no unequivocal definition of the strength of a brittle solid. The maximum stress criterion of failure and the statistical conception of strength, based on the assumed presence of flaws in the material, are compared and the implications of the latter are indicated. ***J. White.*** *British Ceramic Society, Transactions*, v. 57, Oct. 1958, p. 591-623.

1289 A Sonic Spalling Test. A spalling test is described in which a test-piece is made to vibrate at its resonant frequency while it is being heated. Cracking is indicated by sudden changes in frequency. Accurate and reproducible measurements can be made of the rate of heating that will crack the test-piece and of the temperature at which the crack occurs. ***J. F. Clements and W. R. Davis.*** *British Ceramic Society, Transactions*, v. 57, Oct. 1958, p. 624-644.

1290 Transient Thermal Stresses Promoted by the Rapid Heating and Cooling of Brittle Circular Cylinders. The validity of the theory for calculating transient thermal stresses in brittle circular cylinders produced by rapid heating and rapid cooling was tested by experiment, using a high-Al_2O_3 ceramic and hot and cold fluidized beds as the heating and cooling media. The agreement between theory and experiment is reasonable in the light of the non-statistical nature of th experiments, and of the assumptions involved in developing and using the theory and in correlating the thermal stress to failure with breaking strength. ***E. Glenny and M. G. Royston.*** *British Ceramic Society, Transactions*, v. 57, Oct. 1958, p. 645-677.

1291 Some Observations and Reservations on Thermal Shock Theory. The mechanical strength of a body should be measured at the same rate of loading as occurs in the thermal stressing when computing the liability to crack. Cracks ought to stop at soft inclusions, pores or hard grog particles. Reference is also made to bodies, inhomogeneous as regards strength, and "tricks" to improve thermal shock resistance. ***M. G. Royston and L. R. Barrett.*** *British Ceramic Society, Transactions*, v. 57, Oct. 1958, p. 678-685.

1292* Ceramics for Machine Tools. I-II. Traces the development of ceramic cutting tools starting with the German "Sinterkorund" of 1930. Best results in present-day tools are obtained by adding carefully controlled amounts of materials such as MgO, CaO, and SiO_2 in quantities up to a few per cent to an Al_2O_3 body. Experience with alumina-based cermets has indicated that small additions of metal give no increase in strength but merely serve to induce wear resistance. ***R. M. Gill and G. Spence.*** *Ceramics*, v. 9, Aug. 1958, p. 30 + 3 pages; Sept. 1958, p. 27-31.

1293* Magnetic Ceramics. Development, Manufacture and Application. ***W. T. Dean.*** *Ceramics*, v. 9, Oct. 1958, p. 42 + 5 pages.

1294 Ceramic Materials for High-Temperature Applications in the Chemical Process Industries. Reviews properties of ceramic materials and their application in some high-temperature processes. A survey of future needs and probable future developments in ceramics indicates possible improvements in materials for use up to about 5000 F; at higher temperatures, it is likely that some expedient such as cooling the walls, use of the reactants as the container, or levitation would be employed in developing the process and be adapted to commerical operation. ***M. Jack Snyder.*** *Chemical Engineering Progress*, v. 54, Nov. 1958, p. 65-66.

1295 Bloated Clay Aggregate. Its Production and Marketing Potential in Florida. The manufacture of lightweight concrete aggregates from common clays is a rapidly growing industry in the United States. Although explorations to date have been limited, it has been established that Florida has extensive clay deposits throughout the central and northern portions of the state. This research was undertaken in the summer of 1955 and 1956 to examine and report on the factors which influence the feasibility of manufacturing and marketing lightweight aggregates in Florida from native clays. ***Merrill J. Roberts.*** *Florida. University. Engineering and Industrial Experiment Station Bulletin No.* 98, June 1958, 52 pp. (TA1 F66b Contin.)

1296 Glass Engineering Handbook. Provides information and data essential for the engineering and technical application of glass in various fields of use. Properties of glass are correlated with a group of compositions widely used for general and special purposes. The subject of fibrous glass is treated separately because of its wide difference from glass in conventional forms. The units employed in the definition of characteristics are not consistent throughout the volume but are varied to conform with engineering practice in different fields. ***E. B. Shand, C. H. Greene, and J. A. Grant.*** 2nd Ed. 484 pp. 1958. McGraw-Hill, New York. (TP857 Sh18g2)

1297 Flexural Strength of Hollow Unit Concrete Masonry Walls in the Horizontal Span. The tests reported herein constitute an attempt to relate the behavior of hollow block masonry concrete walls under lateral thrust to such factors as the wall thickness and span between vertical supports, the strength and moisture content of the blocks at time of loading, and the strength and other characteristics of the mortar employed in running bond. ***A. R. Livingston, Edward Mangotich, and Robert Dikkers.*** *Iowa State College, Iowa Engineering Experiment Station, Engineering Report No.* 29, 1958, 17 pp. (TA1 Io9e Contin.)

1298* Evaluation of Tensile, Compressive, Torsional, Transverse, and Impact Tests and Correlation of Results for Brittle Cermets. Static tests were studied for the determination of mechanical properties of brittle materials. The designs of specimens and apparatus, suitability of the tests to the materials, refinements in test procedures, and the variability of results and their correlation were studied. ***Matthew J. Kerper, Lewis E. Mong, Maurice B. Stiefel, and Sylvanus F. Holley.*** *Journal of Research, National Bureau of Standards*, v. 61, no. 3, Sept. 1958, p. 149-169.

1299* Pseudoternary System Calcium Oxide-Monocalcium Aluminate ($CaO \cdot Al_2O_3$)-Dicalcium Ferrite ($2CaO \cdot Fe_2O_3$). Iron-bearing solid solutions in the system were found to exist as a continuous narrow band extending from $2CaO \cdot Fe_2O_3$ to $6.45CaO \cdot 2.31Al_2O_3 \cdot F_2O_3$. Additional tie lines were established to show the composition of the iron-bearing solid solution phase (Fss) and liquid phases during the course of crystallization of mixtures within the system. ***Terry F. Newkirk and R. D. Thwaite.*** *Journal of Research, National Bureau of Standards*, v. 61, no. 4, Oct. 1958, p. 233-245.

1300* Temperature of the Inversion in Cristobalite. The inversion temperature of cristobalite prepared from pure precipitated silica gel was compared with that of less pure cristobalite, including material derived from quartz. All materials showed a variability in their inversion temperature which was dependent on their thermal history. However, evidence suggested that a sufficiently extended heat treatment at high temperatures would in each case produce a uniform product with invariant inversion temperatures attributable to the low-high and high-low inversions. It is proposed that the variability of the inversion temperature can be rationalized in terms of three rate processes dependent on the temeprature of heat-treatment, viz., nucleation, ordering, and crystal growth. The effects of all other factors known to influence the inversion temperature is either to accelerate or retard the rate of one or more of these processes. ***Raymond F. Walker, Samuel Zerfoss, Sylvanus F. Holley, and Lucy J. Gross.*** *Journal of Research, National Bureau of Standards*, v. 61, no 4, Oct. 1958, p. 251-261.

1301 Machined Beryllium Oxide Shapes. Hot pressed and machined beryllium oxide shapes designed for new applications in nuclear, aircraft, missile, and electronics industries are now being produced by The Beryllium Corp. *Light Metal Age*, v. 16, Oct. 1958, p. 27.

1302* Autogenous Grinding. Recent developments in methods of control have shown that use of ore or rock to grind itself has many advantages to offer in mill circuits where this method of comminution is feasible. ***Harlowe Hardinge.*** *Mining Congress Journal*, v. 44, Oct. 1958, p. 56-62.

1303 Control of Reversible Thermal Expansion of Pyrophyllite Refractories by Talc Additions. ***Wilfred M. Kenan.*** *North Carolina State College, Department of Engineering Research, Bulletin No.* 68, Apr. 1958, 19 pp. (TA21 N81b Vis.)

1304 The Use of Fly Ash as a Pozzolan in Dense and Light-Weight Concrete. Compares some of the properties of foam and solid concrete containing various kinds and amounts of pozzolans (principally fly ashes) to determine if any showed promise for utilization in the manufacture of concrete products. The pozzolans used were fly ashes from North Carolina, Maryland, Connecticut, and Louisiana, and potter's flint. ***James T. Tanner and Wilfred M. Kenan.*** *North Carolina State College,*

Department of Engineering Research, Bulletin No. 69, Apr. 1958, 26 pp. (TA21 N81b Vis.)

1305* Technology of Dense Volume Constant High-Alumina Materials for Blast Furnace Lining. Describes possibilities of producing low porosity and low gas permeability, high strength sillimanite, mullite, and mullite-corundum refractories. (*In Russian.*) Tekhnologiia plotnykh ob'emopostoiannykh vysokoglinozemistykh izdelii dlia kladki domennykh pecheĭ. ***S. A. Zhikharevich, I. A. Getman, and L. A. Kozyreva.*** *Ogneupory*, v. 23, no. 9, 1958, p. 385-395.

1306* Some Processes of Destruction of Highly-Refractory Materials Under Effect of High Temperatures and Variable Gas Medium. Recrystallized alumina, ZrO_2, pure BeO, and SiC were investigated. Describes the advantages of carbides over pure oxides. (*In Russian.*) O nekotorykh protsessakh razrusheniia vysokoogneupornykh materialov pri vozdeĭstvii vysokikh temperatur i peremennoĭ gazovoĭ sredy. ***R. Ia. Popil'skiĭ and G. A. Serova.*** *Ogneupory*, v. 23, no. 9, 1958, p. 421-424.

1307 The Preparation, Crystallography, and Magnetic Properties of the $Li_xCo_{(1-x)}O$ System. Specimens were prepared by the solid-state reaction between Li_2O_2 and CoO at 900 C. The crystal structure of material in the composition range $0 < x < 0.2$ was studied both above and below the antiferromagnetic Curie temperature. ***W. D. Johnston, R. R. Heikes and D. Sestrich.*** *Physics and Chemistry of Solids*, v. 7, no. 1, Oct. 1958, p. 1-13.

1308* Adherence of Reinforcements to Concrete. Concerns straight, normal, and tangential adhesion of steel to mortar and concrete. The causes of adhesion are physical. Surface roughness increases tangential adhesion but not normal adhesion. (*In French.*) Adhérance des armatures au béton. ***R. Dutron.*** *Revue des Matériaux de Construction (Edition C)*, 1958, no. 517, Oct., p. 257-264.

1309* Expanded Perlite, Its Manufacture and Utilization as a Lightweight Aggregate. Physico-chemical processes taking place during expansion of perlite, and its processing into lightweight aggregate in a rotary kiln. Properties of concretes. (*In German.*) Geblähter Perlit, seine Herstellung und Verwendung als Zuschlagstoff. ***János Albert.*** *Silikattechnik*, v. 9, Oct. 1958, p. 453-457.

1310 Alumina-Base Cermets. Solid solutions of Al_2O_3-Cr_2O_3 and Al_2O_3-NiO spinels were combined with Fe metal, and their physical properties were studied. Modulus of elasticity, modulus of rupture, shrinkage, weight change during firing, absorption, tensile strength, and thermal expansion values were determined. Modulus of elasticity values were obtained which equaled or were above the accepted value for Fe alone. ***James G. Stradley and Thomas S. Shevlin.*** *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 54-173, Feb. 1958, 15 pp. (TL507 Un3.18w Vis.)

1311 Thermal Stresses in Bodies of Revolution. Presents a method of solving, by relaxation techniques, the problem of thermal stresses in bodies of revolution, subjcted to a non-uniform but axially symmetric temperature distribution. Thermal stress problems can be solved by replacing the temperature distribution with certain body forces and surface tensions and it is shown here that the stresses can be expressed in terms of two stress functions which satisfy differential equations of the types of Laplace and Poisson. ***J. P. deVries and R. A. Oerth.*** *U. S. Atomic Energy Commission, WAPD*-201, July 1958, 29 pp. (UF767 Un3.1wa Contin.)

1312 Sub-Liquidus Equilibria for the Ternary System SrO-ZrO_2-SiO_2. A new binary compound, $2SrO \cdot ZrO_2$, and a new ternary compound, $6SrO \cdot ZrO_2 \cdot SiO_2$, were synthesized. X-ray diffraction data for these compounds were determined. The unique configuration of the nine subsidiary composition triangles defining the sub-liquids equilibria for the system was established. ***Paul S. Dear.*** *Virginia Polytechnic Institute, Bulletin, Engineering Experiment Station Series No.* 126, June 1958, 10 pp. (TN21 V81b Vis.)

See also: **1697** (ceramic bibliography); **1698** (concrete bibliography); **1736** (specific surface area determination); **1776** (crucible for Ni); **1944** (diamond wheel markings); **1953** (manufacture of cutting tools).

CHEMICAL ENGINEERING

1313 Treatment of Make-Up Feedwater, Condensate, and Recycle Water for Supercritical and Nuclear-Reactor Power-Plant Cycles. A comprehensive view of the experience and practical knowledge, as well as the thought and advanced ideas employed in treatment of water in such power plants of the future as the supercritical and nuclear power stations. An attempt is made to show where pioneering engineering and scientific developments are being applied with little practical long-range experience to support them. ***V. J. Calise and J. H. Duff.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1659-1675.

1314 Mass Transfer in a Bubble Column. The effects of gas and liquid flow rates and of seal height on the absorption of CO_2 in water have been studied. The gas bubbles were formed from 1/16 in. orifices, with both single and multiple hole arrangements. Bubble frequencies were measured using a high speed motion picture camera and are reported graphically as a function of gas flow rate. At high flow rates, considerable breaking up of the bubbles was observed. ***A. I. Johnson and C. W. Bowman.*** *Canadian Journal of Chemical Engineering*, v. 36, no. 6, Dec. 1958, p. 253-261.

1315 Recent Developments in the Manufacture of Chlorine Dioxide. A new process, employing $NaCl_3$, NaCl and H_2SO_4 as raw materials, is outlined. Trends in absorption tower design, in materials of construction and in bleaching with ClO_2 are briefly indicated. ***W. Howard Rapson.*** *Canadian Journal of Chemical Engineering*, v. 36, no. 6, Dec. 1958, p. 262-266.

1316 Catalytic Reforming. Describes the process for upgrading naphtha feedstocks to high octanes using a regenerable Pt catalyst. The various types of fixed units are described and a simplified flow plan of a typical powerforming unit is illustrated. ***N. J. Emms.*** *Canadian Journal of Chemical Engineering*, v. 36, no. 6, Dec. 1958, p. 267-270.

1317* Large-Scale Water Treatment. How the two industrial processes of oil refining and electricity generation can be combined to mutual advantages has been demonstrated in Newark, New Jersey, where one of America's largest and most modern water-treatment plants has been constructed. ***John Grindrod.*** *Chemical & Process Engineering*, v. 39, Oct. 1958, p. 363-364.

1318* Selection of Plant for Mixing Granular Solids. Characteristics of mixing equipment; performance evaluation; methods of determining mixing efficiency. ***H. Bannister.*** *Chemical & Process Engineering*, v. 39, Nov. 1958, p. 385-388.

1319* Drying. Fundamental studies; mass and heat transfer in drying; atomization; effect of drying conditions on product quality; new types of drying equipment. ***W. F. Calus.*** *Chemical & Process Engineering*, v. 39, Nov. 1958, p. 389-392.

1320* Limitations on Pressure Predictions for Water-Drive Reservoirs. Predictions can be erroneous when there is insufficient pressure history to define the characteristics of the aquifer, and when there are errors in the pressure, production, or geologic data. ***L. H. Simons and H. H. Spain.*** *Journal of Petroleum Technology*, v. 10, Oct. 1958, p. 51-53.

1321 Propylene Successfully Alkylated. Alkylate comparable to butylene alkylate in quality is produced when using propylene as only olefin charge. ***Larry Resen.*** *Oil and Gas Journal*, v. 56, no. 47, Nov. 24, 1958, p. 73-75.

1322 Hot Potash Process Purifies Gas at Lone Star's Fashing Plant. ***J. H. Crow and J. R. Dungan.*** *Oil and Gas Journal*, v. 56, no. 47, Nov. 24, 1958, p. 97-99.

1323* Gardner Air Dryer Gives More Production on Existing Machines. May be used to dry pulp, paper and board, as

well as coatings and other applications, on existing machines or for new installations. ***H. B. Wilson.*** *Paper Trade Journal*, v. 142, Nov. 10, 1958, p. 40-42.

1324 The Petroleum Chemicals Industry. Raw materials, end products, and processes. ***Richard Frank Goldstein.*** 2nd Rev. Ed., 458 pp. 1958. E. & F. N. Spon, London. (TP690 G57p2)

1325* Membrane Filtration. A description of techniques involved. ***E. Windle Taylor.*** *Water and Water Engineering*, v. 62, Oct. 1958, p. 447-453.

1326* Petrochemical Horizons for Propylene. III. ***Peter W. Sherwood.*** *World Petroleum*, v. 29, Nov. 1958, p. 80 + 2 pp.

See also: **1294** (ceramic materials for chemical processing); **1574** (calculation of chemical reaction constants); **1707** (low temperature liquid phase oxidation of hydrocarbons).

CHEMISTRY—ANALYTICAL

1327* New Methods in Organic Chemical Analysis and Their Significance in Preparative Operations. II. A rapid and simple method was evolved for the determination of halogens in organic bond. No isolation is required and samples taken from mixtures under preparation may be analyzed directly. (*In German.*) Neue organisch-chemische Bestimmungsmethoden und ihre Bedeutung bei der präparativen Arbeit. II. ***G. Tokár, Gy. Gál, and I. Simonyi.*** *Acta Chimica Academiae Scientiarum Hungaricae*, v. 15, no. 4, 1958, p. 375-384.

1328 Automatic Spectrophotometric Titration of Fluoride, Sulfate, Uranium, and Thorium. A new indicator, quercetin, was utilized in the estimation of Th by a titration with (ethylene dinitrilo) tetraacetic acid. ***Oscar Menis, D. L. Manning, and R. G. Ball.*** *Analytical Chemstry*, v. 30, Nov. 1958, p. 1772-1776.

1329 Neutron Activation Analysis of Aluminum-Base Alloys. Neutron activation analysis was applied to the determination of Cu, Fe, Zn, and Ti in National Bureau of Standards Al alloys. ***William A. Brooksbank, Jr., George W. Leddicotte, and John A. Dean.*** *Analytical Chemistry*, v. 30, Nov. 1958, p. 1785-1788.

1330 Improved Spectrophotometric Method for Determination of Nicotine in Tobacco Smoke. The spectrophotometric method devised for the determination of nicotine by Willits, *et al.* may be used with good results for the determination of nicotine in tobacco smoke, if the acidic smoke concentrate is first steam-distilled for a short time to reduce the background in the ultraviolet spectrum. ***Anders H. Laurene and T. Gibson Harrell.*** *Analytical Chemistry*, v. 30, Nov. 1958, p. 1800-1802.

1331 Determination of Salicylanilide in Varnishes by Ultraviolet Spectrophotometry. A fairly rapid method of high accuracy was developed for the determination of salicylanilide in fungus-resistant varnishes. ***M. H. Swann and M. L. Adams.*** *Analytical Chemistry*, v. 30, Nov. 1958, p. 1807-1808.

1332 Colorimetric Method for Continuous Recording Analysis of Atmospheric Sulfur Dioxide. Sulfur dioxide in the atmosphere can be determined continuously with automatic sampling and recording apparatus. The reaction of sulfurous acid with pararosaniline hydrochloride and formaldehyde produces a red-violet color which is measured colorimetrically. ***Harold L. Helwig and Chester L. Gordon.*** *Analytical Chemistry*, v. 30, Nov. 1958, p. 1810-1814.

1333 Titration of Weak Acids in Nonaqueous Solvents. Potentiometric Studies in Inert Solvents. Phenolic and carboxylic acids were potentiometrically titrated in inert solvents such as benzene, toluene, and gasoline. ***G. A. Harlow and D. B. Bruss.*** *Analytical Chemistry*, v. 30, Nov. 1958, p. 1833-1836.

1334 Analysis of Fixed and Condensable Gases by Two-Stage Gas Chromatography. Complete analysis is accomplished using an apparatus employing one detector and one recorder. ***John J. Madison.*** *Analytical Chemistry*, v. 30, Nov. 1958, p. 1859-1862.

1335 Quantitative Determination of Tris(nonylated Phenyl) Phosphite (Polygard) in Synthetic Rubber and Latex. Method is based on measuring the phenolic fragment made available by alkaline alcoholysis. The method includes a new, fast way of extracting the stabilizer from both latex and raw polymer. ***Aleksandra C. Nawakowski.*** *Analytical Chemistry*, v. 30, Nov. 1958, p. 1868-1872.

1336 Determination of the Metal Content of Paint Driers. EDTA Titration in Alcohol-Benzene Solution. A simple titrimetric method for the determination of the metal content of Ca, Co, Pb, Mn, and Zn driers is rapid, precise, and yields results in close agreement with those obtained by gravimetry and flame photometry. It is based upon the reaction of metal ions with EDTA. ***Claude A. Lucchesi and Clyde F. Hirn.*** *Analytical Chemistry*, v. 30, Nov. 1958, p. 1877-1879.

1337 Gas Analysis During Chlorination Process. Procedure for systematic analysis of gaseous products issuing from chlorinator during the chlorination of oxides and other compounds of elements important in production of nonferrous, including rare, metals. ***A. S. Berengard and M. T. Glushkova.*** *Henry Brutcher Translation No.* 4239, 8 pp. (From *Zavodskaya Laboratoriya*, v. 23, no. 5, 1957, p. 537-539.) Henry Brutcher, Altadena, Calif.

1338 Thermogravimetry and Its Applications in Analytical Chemistry. A literature review based on 55 references. ***Z. F. Shakhova and E. N. Semenovskaya.*** *Henry Brutcher Translation No.* 4302, 15 pp. (From *Zavodskaya Laboratoriya*, v. 22, no. 12, 1956, p. 1430-1435.) Henry Brutcher, Altadena, Calif.

1339 Gas-Liquid Partition Chromatography of Stereoisomeric Methylcyclohexanols. ***R. Komers, K. Kochloefl, and V. Bazant.*** *Chemistry & Industry*, 1958, no. 43, Oct. 25, 1958, p. 1405-1406.

1340* Rapid Quantitative Determination of Copper, Lead, Tin, Iron, and Zinc in Coppers, Bronzes, and Brass. This 50 to 60 minute process differs from other methods by the fact that the test piece is used as the anode for dissolution; there is no nitrous vapor and the analysis is carried out in one container only. (*In French.*) Détermination quantitative rapide du cuivre, du plomb, de l'étain, du fer et du zinc dans les cuivres, bronzes et laitons. ***J. Herrero Maisterra.*** *Chimie Analytique*, v. 40, Oct. 1958, p. 385-387.

1341* Separation of Thermolabile Organic Mixtures Using the Method of Molecular Distillation. Representations of the mechanism of the molecular distillation explain the effect of temperature on the relationship of the coefficients of separation in unbalanced and balanced evaporation. Development of a new column and of methods of calculation in connection with such columns. (*In Russian.*) Razdelenie termicheski nestoĭkikh organicheskikh smeseĭ metodom molekuliarnoĭ distilliatsii. ***V. A. Maliusov and N. M. Zhavoronkor.*** *Collection of Czechoslovak Chemical Communications*, v. 23, no. 9, Sept. 1958, p. 1720-1726.

1342 Colorimetric Method for Estimation of Guthion Residues in Cottonseeds and Cottonseed Oil. ***Paul A. Giang and M. S. Schechter.*** *Journal of Agricultural and Food Chemistry*, v. 6, Nov. 1958, p. 845-848.

1343 Specific Quantiative Colorimetric Method of Analysis for Citral in Lemon Oil. A specific method for citral in the presence of other aldehydes and ketones. ***W. L. Stanley, R. C. Lindwall, and S. H. Vannier.*** *Journal of Agricultural and Food Chemistry*, v. 6, Nov. 1958, p. 858-860.

1344 Polarography of Beryllium. During polarographic determination of Be in a supporting electrolyte consisting of 0.5 M LiCl and at *p*H 2.38, Be, at a concentration of 5×10^{-4}M, has been found to give two well-defined waves, having the values −1.79 V. and −2.00 V. for half wave potentials. ***G. Venkataratnam and Bh. S. V. Raghava Rao.*** *Journal of Scientific & Industrial Research*, v. 17B, Sept. 1958, p. 360-362.

1345 X-Ray Spectrographs for Rapid X-Ray Fluorescence Analysis With Photographic Recording. Curved crystal spectrographs are described covering the range from potassium to uranium. With the higher speed model simultaneous recording of spectra between 0.5 to 2.5 Å or 1.5 to 3.75 Å is possible and minor constituents at the 0.1% level can be detected. A higher sensitivity version (down to 0.001%) employs a scanning device for covering the required wavelength range. With suitable comparison standards the instruments may be used for quantitative as well as qualitative analysis. ***E. F. Priestley.*** *Journal of Scientific Instruments*, v. 35, Nov. 1958, p. 409-413.

1346 Rubeanic Acid Field Test for Copper in Soils and Sediments. In normal soils there are usually 10 to 50 parts of Cu in every million parts of soil. Only 0.2 to 5% of this Cu can be found by any simple cold chemical attack. Now, with rubeanic acid reagent paper, a prospector or field geologist can detect as little as 4 ppm of readily available Cu in soil. ***Harry V. Warren and Robert E. Delavault.*** *Mining Engineering*, v. 10, Nov. 1958, p. 1186-1188.

1347* New 'Spot' Test for Epoxy Resins. Test for bisphenol-type epoxy resins is described that will be useful in routine identification of synthetic resins in coating materials. No reagent is used, other than the cellulose of the filter paper on which the test is observed. ***Melvin H. Swann.*** *Official Digest*, v. 30, Nov. 1958, p. 1277-1279.

1348* The Application of Ion-Exchangers in Detergent Analysis. A method is described for the separation of mixtures of the Na salts of some alkylsulfuric or sulfonic acids, fatty acids, and non-ionic material into three fractions containing strong acid, weak acid, and non-ionic constituents respectively. The mixtures are successively passed over the ion-exchangers Dowex-50X8,[H-|-], Dowex-1,X2,[Ac^-], and Dowex-2,X8,[OH^-]. ***P. Voogt.*** *Recueil des Travaux Chimiques des Pays-Bas*, v. 77, Sept.-Oct. 1958, p. 889-901.

1349* Vapor Phase Chromatography in the Analysis of Polymers. Polyethylene, polyvinyl acetate, phenolic resins, carboxylic resin, methylmethacrylate, ureic resin, and polyester were examined. (*In Italian.*) La cromatografia in fase vapore applicata all'analisi dei polimeri. ***Giorgio De Angelis, Piero Ippoliti, and Nicola Spina.*** *Ricerca Scientifica*, v. 28, no. 7, July 1958, p. 1444-1450.

1350* Quantitative Spectrographic Analysis of the Rare Earth Elements. IX. Determination of Rare Earth Impurities Commonly Associated With Purified Samarium, Gadolinium, Terbium, and Yttrium. Emmission spectrometric methods are described covering the concentration range from the detection limit up to 1%. The basic method involves the direct-current carbon arc excitation of rare earth oxide-graphite mixtures, utilizing the unique similarity in excitation behavior of many of the rare earths to provide a high degree of internal standardization. ***R. N. Kniseley, et al.*** *Spectrochimica Acta*, v. 12, no. 4, Oct. 1958, p. 332-337.

1351* Qualitative Determination of Cobalt by the Method of Precipitation Chromatography. Traces of Co^{2+} can be detected in the presence of large quantities of Ni, Fe, Cu, Mo, and V; 0.06 μgr. Co in a drop is detectable. (*In Russian.*) Kachestvennoe otkrytie kobal'ta metodom asadochnoĭ khromatografii. ***R. N. Golovatyi. V. V. Oshchapovskii, and N. N. Khudiakova.*** *Ukrainskiĭ Khimicheskiĭ Zhurnal*, v. 24, no. 4, 1958, p. 491-494.

1352 A Spectroscopic Test for Silicon in Silico-Organic Compounds. The method employs the Todd Spectranal for detection of emission lines at 6347 and 6371 Å. The test is rapid and simple and is applicable to a wide range of silico-organics. ***Jack Radell, et al.*** *U. S. Air Force, Wright Air Development Center, WADC Technical Note* 58-153, June 1958, 5 pp. (TL507 Un3.18t Contin.)

1353 Polarography of Europium and Ytterbium. The wave characteristics and data for diffusion-current constants were determined for Eu and Yb in LiCl, NH_4Cl, and tetramethyl ammonium bromide. ***James O. Hibbits, Mary R. Menke, and Warren F. Davis.*** *U. S. Atomic Energy Commission, APEX-405*, Aug. 11, 1958, 19 pp. (UF767 Un3.1ap Contin.)

1354 Quantitative Separation of Small Amounts of Rare Earths From Thorium, Uranium, and Zirconium by Ion Exchange. The procedure is based on the ion-exchange chromatographic separation of the rare earths plus added Y carrier from the Th, followed by emission spectrometric determination of the rare-earth impurities in the Y carrier. ***Henry J. Hettel and V. A. Fassel.*** *U. S. Atomic Energy Commission, ISC-851*, Dec. 1956, 66 pp. (UF767 Un3.1is Contin.)

1355 First Conference, Analytical Chemistry in Nuclear Reactor Technology, Nov. 4-6, 1957. Treats analytical chemistry of U, Th, the rare earths, Be, D_2O, graphite, Ti, and Zr. Includes recent specialized methods. ***C. D. Susano, H. S. House, and Margaret A. Marler, editors.*** *U. S. Atomic Energy Commission, TID-7555*, Aug. 1958, 256 pp. (UF767 Un3ti Contin.)

See also: **1732** (micro sample injector for gas chromatography); **2363** (determination of H in welds).

CHEMISTRY—INORGANIC AND GENERAL

1356 Arsenyl Fluoride. Arsenyl fluoride is obtained by fluorinating a mixture containing equimolecular quantities of $AsCl_3$ and glassy As_2O_3. The compound boils at −25.6 C and melts at −68.3 C. ***Grihapati Mitra.*** *American Chemical Society, Journal*, v. 80, Nov. 5, 1958, p. 5639-5640.

1357 Studies of Complexes of the Transition Metals. I. Nickel Complexes With Sulfur Containing Ligands. The formation constants for complexes of Ni(II) with the S- containing ligands (thiocarbonate, dithioloxalate, and dithiolmalonate) have been determined from spectrophotometric measurements in the visible region of the spectrum. The formulas for these complexes were confirmed to be 1:2 complexes, that is, one Ni ion per two ions of the ligand, by the methods of continuous variation and varying mole ratio. ***William A. Deskin.*** *American Chemical Society, Journal*, v. 80, Nov. 5, 1958, p. 5680-5682.

1358* New Procedure for the Preparation of Silicon and Boron Hydrides. Halogen-containing compounds of Si or B are hydrogenated to form H compounds by introducing them into a melt of alkali or alkaline earth halogenides or combinations of both in which alkali or alkaline earth hydrides are dissolved. (*In German.*) Neues Verfahren zur Darstellung von Silicium- und Borwasserstoffen. ***W. Sundermeyer and O. Glemser.*** *Angewandte Chemie*, v. 70, no. 20, Oct. 21, 1958, p. 625-628.

1359 Annual Reports on the Progress of Chemistry for 1957. Developments in general, physical, inorganic, biological, and analytical chemistry are summarized. v. LIV. 445 pp. 1958. The Chemical Society, London. (QD1 C42a Vis.)

1360 The Chemical Behavior of Zirconium. A comprehensive treatment of the behavior of the element in various conditions by means of descriptions of the preparation and properties of Zr-containing substances, their uses, and measured and deduced details of their structure and the nature of their chemical bonding. ***Warren B. Blumenthal.*** 398 pp. 1958. D. Van Nostrand Company, Princeton, N. J. (QD181.Z7 B62c)

1361 New Methods of Preparing Polonium Metal. Preparation by the action of aqueous NH_3 on polonium hydroxide and of anhydrous NH_3 on the hydroxide and some other Po compounds. ***K. W. Bagnall, P. S. Robinson, and M. A. A. Stewart.*** *Chemical Society, Journal*, 1958, Oct., p. 3426-3428.

1362* Active Silicon Obtained by Means of the Reaction of $SiCl_4$ and Si_2Ca. The reaction with $SiCl_4$ vapor reveals the variation of reaction rate with temperature. Both active and inactive Si is set free. With a $SiCl_4$ solution the reaction is not complete, but silicide that has not been attacked can be separated by using dense liquids. (*In French.*) Sur du silicium actif obtenu par réaction entre le chlorure $SiCl_4$ et le bisiliciure de calcium Si_2Ca. ***Jean Lang.*** *Comptes Rendus Hebdomadaires*

des Séances de l'Académie des Sciences, v. 247, no. 11, Sept. 15, 1958, p. 819-822.

1363 UF_6-3NaF Complex Formation and Decomposition. Sodium fluoride absorption of UF_6 as a method of trapping, handling, and storing. ***G. I. Cathers, M. R. Bennett, and R. L. Jolley.*** *Industrial and Engineering Chemistry*, v. 50, Nov. 1958, p. 1709-1710.

1364 Fluosilicic Acid. Preparation and properties of fluosilicic acid and some of its important uses as well as those of its metallic salts, the fluosilicates. ***Ervin Colton.*** *Journal of Chemical Education*, v. 35, Nov. 1958, p. 562-563.

1365* Study of the Effect of Oxygen on the Reaction of Alkaline Metal Chlorides With Magnesium Sulfate, During Heating. $MgSO_4 + 2MCl + \frac{1}{2}O_2 = MgO + M_2SO_4 + Cl_2$ (MCl = KCl, NaCl) reaction was studied as possible industrial process. (*In Russian.*) Izuchenie vliianiia kisloroda na reaktsiiu khloridov shchelochnykh metallov s sernokislym magniem pri nagrevanii. ***O. I. Shor, S. D. Shargordskii, and A. S. Barabanova.*** *Ukrainskii Khimicheskii Zhurnal*, v. 24, no. 4, 1958, p. 521-525.

1366 Elution of Copper and Neodymium From a Cation-Exchange Resin With Ammonia-Ethylenediaminetetraacetic Acid Solutions. The experiments described establish the groundwork which was necessary to design an ideal elution system. ***Lyle K. Matson and F. H. Spedding.*** *U. S. Atomic Energy Commission, ISC*-1014, Dec. 1957, 48 pp. (UF767 Un3.1is Contin.)

1367 Chemistry Division Annual Progress Report for Period Ending June 20, 1958. Reports ORNL work in nuclear chemistry, isolation and chemical properties of synthetic elements, chemical separation of isotopes, radiation chemistry, chemistry of aqueous systems and corrosion, nonaqueous systems at high temperatures, chemical physics, and organic chemistry. ***E. H. Taylor.*** *U. S. Atomic Energy Commission, ORNL*-2584, Oct. 23, 1958, 117 pp. (UF767 U3o Contin.)

1368* Reducing Ability of Diborane and Some of Its Derivatives. Use in determination of hydride hydrogen. Titration of borohydride with $AgNO_3$. Diborane does not react quantitatively with the aqueous oxidizing solutions. (*In Russian.*) O vosstanovitel'noĭ sposobnosti diborana i nekotorykh ego proizvodnykh. ***V. I. Mikheeva, N. N. Mal'tseva, and E. M. Fedneva.*** *Zhurnal Neorganicheskoĭ Khimii*, v. 3, no. 10, Oct. 1958, p. 2225-2230.

See also: **1708** (chemical literature of Australia and New Zealand); **2100** (chemistry of transuranium elements).

CHEMISTRY—ORGANIC

1369* Synthesis of Aromatic Compounds of Germanium by Means of Aryldiazonium Boron Trifluorides. Decomposition of phenyldiazonium boron trifluoride in presence of $GeCl_4$ and Zn-dust in acetone. Unlike $SnCl_4$ and $PbCl_4$, the $GeCl_4$ does not form double salts with aryldiazonium chlorides. Zinc (in dust form) appears to be the best metal-reducer, absolute acetone the best solvent. (*In Russian.*) Sintez aromaticheskikh soedineniĭ germaniia posredstvom arildiazoniĭboroftoridov. ***A. N. Nesmeianov, L. I. Emel'ianova, and L. G. Makarova.*** *Akademiia Nauk SSSR, Doklady*, v. 122, no. 3, Sept. 21, 1958, p. 403-404.

1370 A New Aldehyde Synthesis—The Reduction of Acid Chlorides by Lithium Tri-*t*-butoxyaluminohydride. A preparative route from the carboxylic acids to the corresponding aldehydes. ***Herbert C. Brown and B. C. Subba Rao.*** *American Chemical Society, Journal*, v. 80, Oct. 20, 1958, p. 5377-5380.

1371 The Reaction of Some Silicon Hydrides With Sulfur-Containing Heterocycles and Related Compounds. ***Dietmar Wittenberg, Herbert A. McNinch, and Henry Gilman.*** *American Chemical Society, Journal*, v. 80, Oct. 20, 1958, p. 5418-5422.

1372 Reactions of Diolefins at High Temperatures. II. The Cyclization of 1,6-Octadiene and 7-Methyl-1,6-octadiene. Evidence for an intramolecular mechanism for the thermal cyclization of 1,6-diolefins. ***William D. Huntsman, Victor C. Solomon, and Donald Eros.*** *American Chemical Society, Journal*, v. 80, Oct. 20, 1958, p. 5455-5458.

1373 The Structure of Terreic Acid. The formulation of terreic acid is determined to be 5,6-epoxy-3-hydroxytoluquinone. ***John C. Sheehan, William B. Lawson, and Richard J. Gaul.*** *American Chemical Society, Journal*, v. 80, Oct. 20, 1958, p. 5536-5538.

1374 Fluorine-Containing Pyrimidines and Purines: Synthesis and Properties of Trifluoromethyl Pyrimidines and Purines. Syntheses of the following purines are described: 6- and 8-trifluoromethyl, 2-amino- 6-trifluoromethyl, 2,6-diamino - 8-trifluoromethyl, and 2 - amino-6,8-bis-trifluoromethyl. The syntheses of the 2- and 8-trifluoromethyl derivatives both of hypoxanthine and adenine also are described. ***Alfredo Giner-Sorolla and Aaron Bendich.*** *American Chemical Society, Journal*, v. 80, Nov. 5, 1958, p. 5744-5752.

1375 Mechanism of the Dehydrocyclization of *n*-Heptane. ***John J. Mitchell.*** *American Chemical Society, Journal*, v. 80, Nov. 5, 1958, p. 5848-5851.

1376 A Spectrometric Study of the Reactions of Ketosteroids in Sulphuric Acid. The reactions of C_3 ketosteroids in concentrated and fuming H_2SO_4 were studied by following the development of their absorption spectra. The results are attributed to protonation of the C_3 keto oxygen in 98%-100% acid, and to removal of the C_3 keto oxygen in fuming acid. ***Hilda F. Goldberg and J. H. Linford.*** *Canadian Journal of Biochemistry and Physiology*, v. 36, Nov. 1958, p. 1221-1236.

1377 Guanidine Compounds. II. Preparation of Mono- and N,N-Di-alkylguanidines. ***R. A. B. Bannard, A. A. Casselman, W. F. Cockburn, and G. M. Brown.*** *Canadian Journal of Chemistry*, v. 36, Nov. 1958, p. 1541-1549.

1378 The Chemistry of the "Aminochromes". II. The Preparation, Paper Chromatography, and Spectroscopic Properties of Pure Adrenolutin; the Infrared Spectrum of Adrenochrome. ***R. A. Heacock and M. E. Mahon.*** *Canadian Journal of Chemistry*, v. 36, Nov. 1958, p. 1550-1554.

1379 The Preparation of Some New Substituted Naphthylamines and Naphthidines. The Fries and Lohmann oxidation of 2-methyl-1-naphthylamine to 3,3'-dimethyl-naphthidine is applied to the oxidation of a number of 2-substituted 1-naphthylamines and is shown to be a general reaction for the preparation of 3,3'-disubstituted naphthidines. ***R. Belcher, S. J. Lyle, and W. I. Stephen.*** *Chemical Society, Journal*, 1958, Oct., p. 3243-3248.

1380 Chemistry of the Vitamin B_{12} Group. VII. The Products of Chromic Acid Oxidation. Chromic acid oxidation of dehydrovitamin B_{12} and the hexacarboxylic acid, but not of vitamin B_{12} or its acid degradation products, yields a new imide-lactam. ***V. M. Clark, A. W. Johnson, I. O. Sutherland, and Alexander Todd.*** *Chemical Society, Journal*, 1958, Oct., p. 3283-3289.

1381* Redox Measurement as Indicator in the Production of Nitroglycerin and Other Explosives. Nitric acid concentration in the making of explosives. Nitrous acid function in nitric acid with different water contents and in mixtures of HNO_3 and H_2SO_4. Redox measurement in the zone of reaction; secondary reactions. (*In German.*) Redoxmessung als Indikator bei der Herstellung von Nitroglyzerin und ähnlichen Sprengstoffen. ***Valter Ohman.*** *Chemiker-Zeitung*, v. 82, no. 18, Sept. 20, 1958, p. 651-656.

1382* Constitution of the Products Obtained by Means of the Alkali or Thermal Condensation of Dimethylol Urea. Infrared Spectra of Some Uron-Type Compounds. (*In German.*) Über die Konstitution der durch alkalische oder thermische Kondensation von Dimethylolharnstoff entstehenden Produkte. Infrarotspektren einiger Verbindungen vom Urontyp. ***Hermann J. Becher and Fritz Griffel.*** *Chemische Berichte*, v. 91, no. 10, 1958, p. 2032-2039.

1383* Determination of Syntheses and Configurations in the Rotenoid Series. V. Partial Synthesis of Rotenone and Dihydrorotenone. Partial synthesis of above by means of Oppenauer-oxidation of rotenol and dihydrorotenol. Dihydrorotenol is accessible from derritol or dihydroderritol through dehydrorotenone or dihydro-dehydrorotenone and subsequent sodium borohydride reduction. (*In German.*) Synthesen und Konfigurationsermittlung in der Rotenoid-Reihe. V. Partialsynthese des Rotenons und Dihydrorotenons. ***Masateru Miyano and Masanao Matsui.*** *Chemische Berichte*, v. 91, no. 10, 1958, p. 2044-2052.

1384* A Contribution to the Study of the Products of the Common Action of Sulfur Dioxide and Chlorine on Aliphatic Hydrocarbons in Ultraviolet Light. IX. Problem of Sulfochlorination in the Tertiary Carbon Atom. (*In German.*) Zur Kenntnis der Produkte der gemeinsamen Einwirkung von Schwefeldioxyd und Chlor auf aliphatische Kohlenwasserstoffe im ultravioletten Licht. IX. Zum Problem der Sulfochlorierung am teritären Kohlenstoffatom. ***Friedrich Asinger, Gerhard Geiseler, and Manfred Hoppe.*** *Chemische Berichte*, v. 91, no. 10, 1958, p. 2130-2142.

1385* A New Method to Prepare Mixed Di-Esters From Orthophosphoric Acid. The orthophosphoric dimethyl-alkyl (or aryl) tri-esters react on trimethylamine and lead to methyl-alkyl or aryl tetramethyl ammonium phosphates. The tetramethylammonium ion can be eliminated by means of resin ion exchangers or double decomposition. (*In French.*) Nouvelle méthode de préparation des di-esters mixtes de l'acide orthophosphorique. ***Jean Cheymol, Pierre Chabrier, Mohamed Selim, and Pierre Leduc.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 247, no. 14, Oct. 6, 1958, p. 1014-1016.

1386 Investigation of Electrochemical Characteristics of Organic Compounds. II. Aromatic Nitroso Compounds. The high theoretical ampere-minute capacity of the aromatic C-nitroso compounds, along with their high flat operating potentials, show these materials to have considerable promise for use as cathode materials in primary cells, when coupled with a Mg anode. ***R. Glicksman and C. K. Morehouse.*** *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 613-619.

1387 A Bicyclic Lactone Obtained From Citrylidene-Acetic Acid. By the Reformatzky reaction between citral and ethyl bromoacetate, ethyl citrylideneacetate and a partly crystallized bicyclic ô-lactone were obtained. The lactone, m. p. 64 C, not noticed by other workers, was studied. The saturated dihydro compound, m. p. 36 C, was prepared. Reduction of the two lactones gave the two corresponding monocyclic diols, m. p. 119 C and 80 C respectively. (*In German.*) Über ein bicyclisches Lacton aus Citryliden-essigsäure. ***P. de Tribolet, G. Gamboni, and H. Schinz.*** *Helvetica Chimica Acta*, v. 41, no. 6, 1958, p. 1587-1602.

1388 Dealkylation of Organic Compounds. Benzene From Toluene. The hydrogenolysis or hydrocracking process for transforming toluene to benzene on a pilot-plant scale. ***Thomas F. Doumani.*** *Industrial and Engineering Chemistry*, v. 50, Nov. 1958, p. 1677-1680.

1389 Reaction of Potassium 2,2-Dinitroethanol and Ammonia. ***Karl Klager.*** *Journal of Organic Chemistry*, v. 23, Oct. 1958, p. 1519-1521.

1390 Organic Sulfur Derivatives. V. Preparation and Properties of Some Long-Chain Mercapto Acids and Related Compounds. Fatty acids and their methyl esters were prepared with a mercapto substituent in the center of the chain, alpha to the carboxyl or carbomethoxy group, and in the terminal position. ***N. H. Koenig, George S. Sasin, and Daniel Swern.*** *Journal of Organic Chemistry*, v. 23, Oct. 1958, p. 1525-1530.

1391 Reactions of Pyridine-Type Bases With Iodine and Certain Quinolines or Isoquinolines Containing a Reactive Methyl Group. Quinoline-type bases with a methyl group in the 2 or 4 position and isoquinoline-type bases with a methyl group in the 1 position undergo reaction with I and pyridine, or certain bases related to pyridine, to give quaternary salts. The preparation and structure of a number of these quaternary salts is described. ***L. Carroll King and S. V. Abramo.*** *Journal of Organic Chemistry*, v. 23, Nov. 1958, p. 1609-1612.

1392 Use of Anion Exchange Resins in the Synthesis of Benzyl Ethers of Phenols. Conventional column and batch techniques are used. Eleven benzyl ethers have been prepared and identified. ***Edward J. Rowe, Karl L. Kaufman, and Claude Piantadosi.*** *Journal of Organic Chmistry*, v. 23, Nov. 1958, p. 1622-1624.

1393 2-Phenyl-1,3-Butadiene and Related Compounds. Preparation of 2-phenyl-1,3-butadiene from acetophenone and vinylmagnesium bromide in a two-step process; synthesis and properties of several new and related compounds. ***C. S. Marvel and R. G. Woolford.*** *Journal of Organic Chemistry*, v. 23, Nov. 1958, p. 1658-1660.

1394 Preparation and Some Properties of Certain Fluorovinyl Iodides and Some Fluorinated Butadienes. $CF_2{=}CHI$, $CF_2{=}CClI$, $CF_2{=}CBrI$, and $CF_2{=}CI_2$ were prepared and some of their reactions with various olefins studied. In all cases, a 1:1 linear adduct was formed, with the formation of small amounts of higher boiling fractions. A number of fluoro-1,3-butadienes were obtained from these adducts and their physical properties were tabulated. ***J. D. Park, et al.*** *Journal of Organic Chemistry*, v. 23, Nov. 1958, p. 1661-1665.

1395 Formation of Carbenes From α-Haloesters. Reaction of butylate ion with the *t*-butyl esters of chloroacetic dichloroacetic, and trichloroacetic acid. It was shown that carbene intermediates result from the di- and tri-chloro esters. ***William E. Parham and Frederic C. Loew.*** *Journal of Organic Chemistry*, v. 23, Nov. 1958, p. 1705-1708.

1396* On the Catalytic Properties of Organic Complex Compounds. The reaction of alkylating benzene with *iso*-amyl chloride in the presence of $AlCl_3$ or metallic Al activated with HCl and Hg. The complex compounds formed have good catalytic properties (*In Polish.*) O katalitycznych własnościach organicznych połaczeń kompleksowych glinu. ***Tadeusz Mazoński and Alfred Hopfinger.*** *Przemysł Chemiczny*, v. 37, no. 9, Sept. 1958, p. 590-592.

1397* Investigations on Pyrazine Derivatives. II. The Preparation of Pyrazine 2,3,5-Tricarboxylic Acid and of Pyrazine 2,5- and 2,6-Dicarboxylic Acids. III. The Preparation of 2,3-Dihydroxyprazine 5,6-Dicarboxylic Acid. ***H. I. X. Mager and W. Berends.*** *Recueil des Travaux Chimiques des Pays-Bas*, v. 77, Sept.-Oct. 1958, p. 827-849.

1398* Some Reactions of 1,1,1,3-Tetrachlorobutane. Above reacts with an excess of many nucleophilic reagents to give good yields of products $Cl_2C{=}CH\text{-}CHX\text{-}CH_3$, in which X may be an OH, O-alkyl, O-aryl, aryl-OH, NH_2, alkylamino, or dialkylamino group. ***E. C. Kooyman and W. M. Wagner.*** *Recueil des Travaux Chimiques des Pays-Bas*, v. 77, Sept.-Oct. 1958, p. 923-932.

1399* The Preparation of Some Dialkyl *p*-Nitrophenyl Phosphates. Preparation by the interaction of dialkyl phosphorochloridates and sodium *p*-nitrophenoxide. Physical constants and infrared spectra. ***A. M. De Roos and H. J. Toet.*** *Recueil des Travaux Chimiques des Pays-Bas*, v. 77, Sept.-Oct. 1958, p. 946-955.

1400 The Gaseous Oxidation of Tertiary Aliphatic Amines. III. *N*-methyl Diethylamine and *N*-ethyl Dimethylamine. ***C. F. Cullis and D. J. Waddington.*** *Royal Society, Proceedings*, v. 248, ser. A, Oct. 28, 1958, p. 136-143.

1401 Production of Perarylated Monosilanes. Investigates methods of synthesis, to characterize, and to prepare multiple pound quantities of the series of phenyl biphenylyl silanes and mixed isomeric biphenylyl phenyl silanes. ***Amos R. Anderson, Robert W. Lerner, William E. Smith, and Russell S. Towers.*** *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 57-620, Sept. 1957, 58 pp. (TL507 Un3.18w Vis.)

1402 A Basic Study on Development of Diesters With Improved Thermal and Hydrolytic Stability. Describes the preparation, synthesis, and testing of dibasic acid diesters with

substituents near the reactive centers and the literature study made to establish a sound theoretical basis and procedures for these preparations. The objective was to improve the thermal and hydrolytic stability of dibasic acid diesters. ***A. M. Durr, Jr. and C. E. Thompson.*** *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 58-170, Mar. 1958, 71 pp. (TL507 Un3.18w Vis.)

1403 On the Chemical Constitution of a Lignitic Resin. The coal employed in this study was a North Dakota lignite, Sentinel Butte member, of the Paleocene Fort Union formation. Data include separation procedures and a detailed analysis of components based on solubility tests, molecular weights, absorption spectra, radioactivity, etc. ***James Joseph Tietjen.*** *U. S. Atomic Energy Commission, NYO*-7947, July 18, 1958, 56 pp. (UF767 U3ny Contin.)

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1404* Investigations on Catalysts. XIX. Changes in the Sorption of Hydrogen as a Function of the Quantity of Catalyst and Carrier. *Z. Csűrös, I. Géczy, and J. Morgós.* *Acta Chimica Academiae Scientiarum Hungaricae*, v. 16, no. 3, 1958, p. 301-319.

1405* On the Mechanism of Migration of Hydrogen and Hydroxyl Ions. II. Transference Numbers of HCl, KOH, KF, and KCl in Mixtures of Methanol-Water at 5 and 25° C. The mobilities of ions, the products of mobility and viscosity, and the temperature coefficients of mobilities were calculated. (*In German.*) Über den Wanderungsmechanismus der Wasserstoff- und Hydroxylionen. II. Überführungszahlen von HCl, KOH, KF und KCl in Gemischen aus Wasser und Methanol bei Temperaturen von 5 bzw. 25° C. ***T. Erdey-Grúz and L. Majthényi.*** *Acta Chimica Academiae Scientiarum Hungaricae*, v. 16, no. 4, 1958, p. 417-438.

1406* Variation of Viscosity With Temperature of Highly Concentrated Aqueous Solutions of Some Strong Electrolytes. Andrade's equation has now been found to apply to highly concentrated aqueous solutions of strong electrolytes KCl, KNO_3, NaCl, and $NaNO_3$. ***C. V. Suryanarayana and V. K. Venkatesan.*** *Acta Chimica Academiae Scientiarum Hungaricae*, v. 16, no. 4, 1958, p. 451-460.

1407* Investigation of the Catalytic Dehydrogenation of Hydrocarbons and Alcohols Over Metallic Rhenium. (*In Russian.*) Issledovanie kataliticheskoĭ degidrogenizatsii uglevodorodov i spirtov nad metallicheskim reniem. ***A. A. Balandin, E. I. Karpeiskaia, and A. A. Tolstopiatova.*** *Akademiia Nauk SSSR, Doklady*, v. 122, no. 2, Sept. 11, 1958, p. 227-230.

1408* A Study of Low-Temperature Methane Oxidation Initiated by Oxygen Atoms Formed During Thermal Disintegration of Ozone. Oxidation of aerated methane, from which CO_2 and unsaturated hydrocarbons were removed, by ozonized oxygen at atmospheric pressure in a jet installation with contact time from 6 to 32 sec. Analysis of ozone and methyl hydroperoxide by iodometric method. Determination of formaldehyde by polarographic or hydroxylamine method. (*In Russian.*) Issledovanie reaktsii nizkotemperaturnogo okisleniia metana, initsiirovannoĭ atomami kisloroda, obrazuiushchihmisia pri termicheskom raspade ozona. ***N. A. Kleimenov and A. B. Nalbandian.*** *Akademiia Nauk SSSR, Doklady*, v. 122, no. 3, Sept. 21, 1958, p. 420-423.

1409* A Study of Benzene Vapor Adsorption on Palladium Films. (*In Russian.*) Izuchenie adsorbtsii parov benzola na plenkakh palladiia. ***V. D. Iagodovskiĭ.*** *Akademiia Nauk SSSR, Doklady*, v. 122, no. 3, Sept. 21, 1958, p. 437-440.

1410 Solvent Effects and Initiator Efficiency in the Benzoyl Peroxide-Dimethylaniline System. The second-order reaction between benzoyl peroxide and dimethylaniline has been followed in two ways: directly by measuring undecomposed peroxide, and indirectly, by observing changing polymerization rates while the pair was being used as polymerization initiator. ***Cheves Walling and Norman Indictor.*** *American Chemical Society, Journal*, v. 80, Nov. 5, 1958, p. 5814-5818.

1411 Organic Reactions Under High Pressure. IV. The Dimerization of Isoprene. The dimerization of isoprene is strongly accelerated by pressure and leads to six different isomeric products of which 1-methyl-4-isopropenylcyclohexane, 2-methyl-4-isopropenylcyclohexene, and 4-ethenyl-2,4-dimethylcyclohexene are present in the largest quantity. ***Cheves Walling and Jack Peisach.*** *American Chemical Society, Journal*, v. 80, Nov. 5, 1958, p. 5819-5824.

1412 The Gas Phase Reactions of Perfluoro-*n*-Propyl Radicals With Methane and Ethane. The rate constants and activation energies for the reactions of C_3F_7 radicals with methane and ethane have been measured by photolyzing mixtures of $C_3F_7COC_3F_7$ and hydrocarbon with 3130 Å light. ***G. Giacometti and E. W. R. Steacie.*** *Canadian Journal of Chemistry*, v. 36, Nov. 1958, p. 1493-1500.

1413 Fading and Tendering Activity in Anthraquinonoid Vat Dyes. IV. Polarographic Oxidation of *leuco*-Dyes. V. Photo-Dehalogenation and -Oxidation of *leuco*-Solutions. VI. The Coulometry of the Polarographic Oxidation of *leuco*-Dyes. *C. J. Cooper and H. I. Stonehill.* *Chemical Society, Journal*, 1958, Oct., p. 3341-3367.

1414 Ion-Exchange Properties of Cellulose Phosphate. The influence of the preparative conditions and structure of the ester on its ion-exchange properties is discussed. ***A. J. Head, N. F. Kember, R. P. Miller, and R. A. Wells.*** *Chemical Society, Journal*, 1958, Oct., p. 3418-3425.

1415 The Reaction of Tetramethyl-lead and Trimethyllead Chloride With Alkali Metals in Liquid Ammonia. *A. K. Holliday and G. Pass.* *Chemical Society, Journal*, 1958, Oct., p. 3485-3488.

1416 Radiation Chemistry of Carbohydrates. I. Action of Ionising Radiation on Aqueous Solutions of *D*-Glucose. II. Irradiation of Aqueous Solutions of Dextran With Gamma Radiation. I. ***G. O. Phillips, G. J. Moody, and G. L. Mattok.*** II. ***G. O. Phillips and G. J. Moody.*** *Chemical Society, Journal*, 1958, Oct., p. 3522-3539.

1417 The Conductivity of Some Salts in Ethanol-Water Mixtures. Conductivities of $CoCl_2$, $CoSO_4$, $MgSO_4$, $KBrO_3$, $AgNO_3$, and $ZnClO_4$ in some ethanol-water mixtures at 25 C. ***C. W. Davies and G. O. Thomas.*** *Chemical Society, Journal*, 1958, Oct., p. 3660-3663.

1418* Infrared Spectroscopic Investigation of Methyl Urea-Methyl Ethers and Analogous Thiourea Derivatives. In the spectroscopic examination of a condensation product from dimethyl urea-dimethyl ethers a band was observed at 860 cm^{-1} that is attributed to tri-substituted urea groups, and allows identification of ramifications in urea-formaldehyde condensates. (*In German.*) Infrarotspektroskopische Untersuchung an Methylolharnstoff-methyläthern und analogen Thioharnstoffderivaten. ***Herman J. Becher and Fritz Griffel.*** *Chemische Berichte*, v. 91, no. 10, 1958, p. 2025-2031.

1419 The Viscosity of Coal Tar Products. The basic question: log log $(V + 0.8) = K - K_1 \log T$ describes the temperature-viscosity relationship of coal tar constituents and of coal tar products such as pitch, the prepared tars and the tar oils. K and K_1 are constants, the value of which for a mixed product can be calculated by addition if the K- and K_1 - values of the mixture components are known. ***H. -G. Franck and O. Wegener.*** *Coal Tar Research Association, Report No.* 0210, Sept. 22, 1958, 42 pp. (TP953 C63 Contin.)

1420* Irreversible Transformations and Variations of the Catalytic Activity of Mixed Alumina-Silica Gels. Gel samples were prepared by heating in air between 375 and 1035 C. Specific surface measurements were made and differential thermal analyses performed at a temperature increase of 9 degs. per min. A decrease of specific surface occurred above 700 and 750 C. (*In French.*) Transformation irréversible et variations de l'activité catalytique de gels mixtes silice-alumine. ***Yves Trambouze, Marcel Perrin, Jean-Louis Weill, and Marcel Prettre.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 247, no. 14, Oct. 6, 1958, p. 998-1000.

1421 The Selective Hydrogenation of Acetylene. A study of the degree of selectivity of ethylene formation in the hydro-

genation of C_2H_2 catalyzed by Rh, Pd, and Pt and some Pd + Ag mixtures supported on α-Al_2O_3. ***G. C. Bond, D. A. Dowden, and N. Mackenzie.*** *Faraday Society, Transactions*, v. 54, Oct. 1958, p. 1537-1546.

1422 A Dilatometric Method of Measuring Heats of Radiation-Induced Reactions. I. The Heat of Polymerization of Vinyl Acetate. The method involves the measurement of contraction as a function of time under conditions of continuous irradiation and also immediately following the end of irradiation. From these data together with a knowledge of the physical properties of the reactants and products, the heat of reaction can be calculated. ***W. I. Bengough.*** *Faraday Society, Transactions*, v. 54, Oct. 1958, p. 1560-1566.

1423 The Correlation of Internal Friction and Chemical Structure in Organic Glasses. The internal friction of a number of organic glasses was measured over a wide range of frequency. At the lower frequencies, the glasses are distinguished from one another by the extent to which the dependence of the internal friction on frequency conforms to the theoretical predictions for a Maxwell body. At high frequencies the internal friction of each glass tends towards a definite, frequency-independent, value. ***J. J. Benbow and D. J. C. Wood.*** *Faraday Society, Transactions*, v. 54, Oct. 1958, p. 1581-1587.

1424 Explosive Reaction of Diborane in Dry and Water-Saturated Air. The rate of flame propagation and the pressure-time characteristics of the explosive reaction of diborane in dry and saturated air. ***Edgar L. Poling and H. P. Simons.*** *Industrial and Engineering Chemistry*, v. 50, Nov. 1958, p. 1695-1698.

1425 Effect of Ionizing Radiation on Aqueous Permanganate Solutions. Permanganate is never reduced entirely to Mn^{++}, whatever the acidity between .01 N and 8 N H_2SO_4. The OH radicals do not reoxidize Mn^{++} because of the reaction $2\ MnO4^- + 3\ Mn^{++} + 4\ OH^- \rightarrow 5\ MnO_2 + 2H_2[O]$. (*In French.*) Action des radiations ionisantes sur les solutions aqueuses de permanganate. ***Gabriel Simonoff.*** *Journal de Chimie Physique*, v. 55, nos. 7-8, July-Aug. 1958, p. 547-558.

1426 Aerosol Size and Relative Humidity. A theoretical and experimental investigation was made of the gain and loss of water with humidity change for particles of NaCl, $(NH_4)_2SO_4$, $CaCl_2.6H_2O$, AgI, PbI_2, and KCl having radii between 0.01 and 0.1 micron. ***Clyde Orr, Jr., F. Kenneth Hurd, and William J. Corbett.*** *Journal of Colloid Science*, v. 13, no. 5, Oct. 1958, p. 472-482.

1427 Effect of Cobaltous 2-Ecthylhexanoate and Other Salts on the Decomposition of Tetralin Hydroperoxide. ***Elizabeth Dyer, Kenneth R. Carle, and Donald E. Weiman.*** *Journal of Organic Chemistry*, v. 23, Oct. 1958, p. 1464-1469.

1428 The Magnetic Properties of the Cobalt Oxides and the System Cobalt Oxide-Alumina. The magnetic moment and Weiss constant are reported for each sample and the magnetic properties shown to be consistent with the structures of the oxides. ***J. T. Richardson and L. W. Vernon.*** *Journal of Physical Chemistry*, v. 62, Oct. 1958, p. 1153-1157.

1429 Rates of Solution of Silver Halide Emulsion Crystals. A method is described for determining the rates of solution of photographic Ag halide grains in various solvents. The mechanism of solution is discussed with respect to the ion complexes involved, the degree of perfection of the grain surface and surface charge effects. ***T. H. James and W. Vanselow.*** *Journal of Physical Chemistry*, v. 62, Oct. 1958, p. 1189-1194.

1430 Metal-Polyelectrolyte Complexes. V. Preparation and Properties of a New Polychelate—Polyvinylacetonyl Ketone. The acid dissociation constant and binding constants for metallic ions were determined in 4/1 dioxane-water solutions for the polymer and its monomeric analog, acetylacetone. Chelation constants were also determined. ***Guenther K. Hoeschele, Julian B. Andelman, and Harry P. Gregor.*** *Journal of Physical Chemistry*, v. 62, Oct. 1958, p. 1239-1244.

1431 Variables Affecting Phase Change in Lithium Stearate-Mineral Oil Systems. Equilibrium phase diagrams have been determined using thermal techniques for pure lithium stearate in six mineral oils and a paraffin wax. A new structure is postulated for the liquid crystal phase. ***David B. Cox.*** *Journal of Physical Chemistry*, v. 62, Oct. 1958, p. 1245-1256.

1432 Inhibition of Foaming. IX. Changes in the Rate of Attaining Surface Tension Equilibrium in Solutions of Surface-Active Agents on Addition of Foam Inhibitors and Foam Stabilizers. The vibrating jet method was used to determine the rate of attaining surface tension equilibrium in solutions of surface-active agents, and to observe the effects of added foam inhibiting and foam stabilizing agents. In every case of eight systems examined, the presence of added foam inhibitors caused an acceleration. ***Sydney Ross and R. M. Haak.*** *Journal of Physical Chemistry*, v. 62, Oct. 1958, p. 1260-1268.

1433 Effect of Recoil Energy on the Chemical Consequences of Nuclear Activation Processes. Activation of Solutions of Iodine in Hydrocarbons. ***Charles E. McCauley and Robert H. Schuler.*** *Journal of Physical Chemistry*, v. 62, Nov. 1958, p. 1364-1368.

1434 The Atomic and Molecular Consequences of Radioactive Decay. Magnetic analysis of ions produced by radioactive decay of gases at low pressure reveals varied atomic and molecular effects. ***Arthur H. Snell and Frances Pleasonton.*** *Journal of Physical Chemistry*, v. 62, Nov. 1958, p. 1377-1382.

1435 Vapor Pressures and Molecular Composition of Vapors of the RbF-ZrF_4 and LiF-ZrF_4 Systems. The vapor pressures of RbF and LiF were measured over the temperature intervals 589-1059 C and 851-1060 C, respectively. Vapor pressures of the RbF-ZrF_4 and LiF-ZrF_4 systems were measured over the ranges 690-1060 C and 670-1060 C, respectively. On the basis of previously developed theory, it was concluded that the complexes $RbZr_2F_9$ and $LiZr_2F_9$ exist in the vapor phase of the respective systems. Plots showing the change of total pressure with composition for various temperatures, as well as melting point curves are given for the various systems. ***Karl A. Sense and Richard W. Stone.*** *Journal of Physical Chemistry*, v. 62, Nov. 1958, p. 1411-1418.

1436 A Theory for Estimation of Interfacial Energies. II. Application to Surface Thermodynamics of Teflon and Graphite. A theory previously proposed for the estimation of interfacial energies is extended to cover the calculation of the surface energy of solids from heats of immersion. ***Robert J. Good, Louis A. Girifalco, and Gerard Kraus.*** *Journal of Physical Chemistry*, v. 62, Nov. 1958, p. 1418-1421.

1437 The Dipole Moments of Alkanethiols. A number of alkanethiols were carefully purified and the boiling points, refractive indices, and dielectric constants determined. The dipole moments of these compounds in benzene solution and in the pure liquid state at 25 C were calculated. ***Simão Mathias and Eurico de Carvalho Filho.*** *Journal of Physical Chemistry*, v. 62, Nov. 1958, p. 1427-1430.

1438 The Heat, Entropy and Free Energy of Formation of Diphenyl Carbonate. ***G. C. Sinke, et al.*** *Journal of Physical Chemistry*, v. 62, Nov. 1958, p. 1461-1464.

1439* Heats of Formation of Diborane and Pentaborane. Heats of formation were determined by measurements of the heats of decomposition into amorphous B and H in a calorimeter. The heats of formation at 25 C, from amorphous B and H, are 6.73 ± 0.52 kcal/mole for diborane (gas) and 12.99 ± 0.39 for pentaborane (gas). ***Edward J. Prosen, Walter H. Johnson, and Florence Y. Pergiel.*** *Journal of Research, National Bureau of Standards*, v. 61, no. 4, Oct. 1958, p. 247-250.

1440* Investigations of the Adsorption of Water Soluble Organic Compounds on Cotton. I. Adsorption of Amino- or Hydroxyl-Substituted Aromatic Compounds. Purified Egyptian raw cotton was used as sorbent. Adsorption properties of 3-oxyphenyl urea and 3-oxydiphenylamine were studied. Effects of bridge atoms between two benzene rings on the sorption of amino- and oxy-compounds and effects of structure on the sorption of some hydroxyl or carboxyl substituted diphenyl derivatives were determined. (*In German.*) Unter-

suchungen über die Adsorption wasserlöslicher organischer Verbindungen an Baumwolle. I. Die Adsorption von amino- bzw. hydroxyl-substituierten aromatischen Verbindungen. ***D. Lamparsky and E. Rack.*** *Kolloid-Zeitschrift,* v. 160, no. 1, Sept. 1958, p. 7-16.

1441* The Effect of Ethylene Glycol on the Colloid Properties of Aqueous Sodium Oleate Solution. A study on the light scattering, viscosity, and electroconductivity of aqueous sodium oleate solutions in the presence of varying amounts of ethylene glycol. (*In Russian.*) Vliianie etilenglikolia na kolloidnye svoĭstva vodnykh rastvorov oleata natriia. ***A. I. Iurzhenko and G. F. Storozh.*** *Kolloidnyĭ Zhurnal,* v. 20, no. 5, Sept.-Oct. 1958, p. 550-555.

1442 Find Specific Gravities by Nomograph. These five nomographs cover hydrocarbon mixtures, petroleum fractions, and 90 pure compounds. ***R. Brown Ritter, John M. Lenoir, and Joseph L. Schweppe.*** *Petroleum Refiner,* v. 37, Nov. 1958, p. 225-232.

1443 Nuclear Radiation as a Reaction Initiator. Suggests some of the possible applications of different radiation sources in the production of polymers, the modification of polymer properties and the activation of catalysts. ***J. F. Black.*** *Research,* v. 11, Nov. 1958, p. 419-424.

1444 Preparation of Thin Anthracene Single Crystals. Anthracene single crystals ranging in thickness from 4 to 80μ and from 0.5 to 2 cm^2 in area have been prepared by crystallization from a selected solution system. Method employs a density and temperature gradient within the solution which permits the crystal to grow while suspended in the solvent. ***H. Kallmann and M. Pope.*** *Review of Scientific Instruments,* v. 29, Nov. 1958, p. 993-994.

1445* Detergent Adsorption on Soil & Substrate. In an attempt at clarification of the detergent process, the role played by the surfactant is considered. ***Jay C. Harris.*** *Soap and Chemical Specialties,* v. 34, Nov. 1958, p. 40-43.

1446* Comparison Study of the Spectra of Vibration of Paradisubstituted Benzene Derivatives. The infrared spectra of 34 paradisubstituted benzene derivatives have been obtained between 1600 and 670 cm^{-1}. The interpretation of these spectra is discussed taking into account the corresponding Raman spectra as reported in the literature. (*In French.*) Etude comparée des spectres de vibration des dérivés paradisubstitués du benzène. I. ***Chantal Garrigou-Lagrange, Jeanne-Marie Lebas, and Marie-Louise Josien.*** *Spectrochimica Acta,* v. 12, no. 4, Oct. 1958, p. 305-320.

1447* Effect of the Reduction Conditions of Industrial Catalysts for Ammonia Synthesis on Their Relative Activity. I. Kinetics of Catalyst Reduction. (*In Russian.*) Vliianie uslovíĭ vosstanovleniia promyshlennykh katalizatorov sinteza ammiaka na ikh udel'nuiu aktivnost'. I. Kinetika vosstanovleniia katalizatora. ***V. K. Skarchenko, M. T. Rusov, O. A. Strel'tsov, N. P. Radchenko, and Iu. A. Snigurovskaia.*** *Ukrainskiĭ Khimicheskiĭ Zhurnal,* v. 24, no. 4, 1958, p. 443-448.

1448 Substituent Effects of the Stability of Metal Chelates. The stability constants of the chelate compounds of a series of substituted diaroylmethanes with several divalent metals in 75% by volume dioxan-water were measured. ***Wilfred G. Borduin and G. S. Hammond.*** *U. S. Atomic Energy Commission, ISC-946,* Dec. 1957, 28 pp. (UF767 Un3.1is Contin.)

1449 The Tributyl Phosphate-Nitric Acid Complex and Its Role in Uranium Extraction. The distribution of HNO_3 between TBP and H_2O at 25 C is shown for equilibrium aqueous HNO_3 concentrations of 0 to 12 molar. Results are presented for U extraction from sulfate, chloride, fluoride, and phosphate systems with TBP and with TBP that contained an equimolar complex with HNO_3. ***Thomas J. Collopy.*** *U. S. Atomic Energy Commisison, NLCO-749,* Apr. 23, 1958, 19 pp. (UF767 Un3.1nL Contin.)

1450* Light Damage of Disaccharides in the Presence of TiO_2-Pigments. Lactose, sucrose, maltose, and cellobiose admixed, and in the absence of, TiO_2 were irradiated with ultraviolet light and the resultant alterations measured. (*In German.*) Die Lichtschädigung von Disacchariden in Gengenwart von TiO_2-Pigment. ***J. Schurz and E. Kienzl.*** *Svensk Papperstidning,* v. 61, no. 19, Oct. 15, 1958, p. 844-850.

1451* The Equivalent Conductance of Electrolytes in Mixed Solvents. V. Tetraethylammonium Picrate in the Water-Ethanol System. Measurements of the equivalent conductance of tetraethylammonium picrate in the concentration range from about $7 \cdot 10^{-3}$ to $9 \cdot 10^{-15}$ equivalents per liter at temperatures of 25, 35, and 45 C were made in pure water, pure ethanol, and mixtures of the two solvents. ***Rayburn Whorton and Edward S. Amis.*** *Zeitschrift für Physikalische Chemie (Neue Folge),* v. 17, nos. 5/6, Sept. 1958, p. 300-314.

1452* The Vibration Spectra and Alkalinity Constants of Alkylene Imines. Results of examination of cyclic imines with 3 to 7 atoms in the ring. (*In Russian.*) Kolebatel'nye spektry i konstanty osnovnosti alkileniminov. ***Iu. N. Sheinker, and E. M. Peresleni.*** *Zhurnal Fizicheskoĭ Khimii,* v. 32, no. 9, Sept. 1958, p. 2112-2118.

1453* The Action of Ionizing Radiation on Aqueous Potassium Nitrate Solutions. The effect of the γ-radiation of Co-60, the β-radiation of P-32, and the α-radiation of Pu-239 on aqueous KNO_3 solutions. It may be suggested that the increase in nitrate ion yield in concentrated solutions as compared with dilute greatly depends upon the solute concentration and little upon the change in ionization density. (*In Russian.*) Deistvie ioniziruiushchikh izluchenii na vodnye rastvory azotnokislogo kaliia. ***A. M. Kabakchi, V. A. Gramolin, and V. M. Erokhin.*** *Zhurnal Fizicheskoĭ Khimii,* v. 32, no. 9, Sept. 1958, p. 2149-2154.

1454* Adsorption of Bromine and Iodine Ions on Platinum. The adsorption of Br and I ions on smooth and platinized Pt from acid solutions in relation to the potential, time, and temperature was studied by a radio tracer method. (*In Russian.*) Adsorbtsiia ionov broma i ioda na platine. ***N. A. Balashova.*** *Zhurnal Fizicheskoĭ Khimii,* v. 32, no. 10, Oct. 1958, p. 2266-2273.

1455* Surface Tension of Ternary Systems. Gives an isotherm equation for the system in which the activity coefficients do not depend on concentration. In solutions of Hg-Cd-Cs and Hg-Cd-K, the maximum surface activity was graphically determined. (*In Russian.*) O poverkhnostnom natiazhenii troĭnykh sistem. ***V. B. Lazarev.*** *Zhurnal Neorganicheskoĭ Khimii,* v. 3, no. 10, Oct. 1958, p. 2347-2353.

1456* The Liquid Phase Oxidation of Benzene to Phenol at Temperatures Near the Critical. Kinetics of the process. Ways of activating the process by addition of readily oxidized substances (cyclohexane, cyclohexanone), catalysts (cobalt stearate), and also by gaseous initiation. (*In Russian.*) Okislenie benzola v fenol zhidkoĭ faze pri temperaturakh, blizkikh k kriticheskoĭ. ***E. T. Denisov and N. M. Emanuel'.*** *Zhurnal Fizicheskoĭ Khimii,* v. 32, no. 10, Oct. 1958, p. 2374-2382.

See also: **2170** (low temperature physics and chemistry); **2232** (contact angle on starch, amylose, amylopectin, cellulose, and PVA).

COATINGS

1457 Protective Organic Coatings for Steel. II. Describes finishing systems for coating steel, including the proper preparation of the steel surface for painting; the right combination of coating materials including primers, primer-surfacers, fillers, and top coats; the correct application of the coating materials; and proper curing of the coatings. ***Louis J. Nowacki and E. R. Mueller.*** *Industrial Heating,* v. 25, Nov. 1958, p. 2308 + 4 pages.

1458 How to Evaluate Organic Coatings. Standard tests for properties and performance of liquid and dry coatings. ***Gerould Allyn and Samuel Gusman.*** *Materials in Design Engineering,* v. 48, Nov. 1958, p. 116-120.

1459* Electrophoretic Deposition—A Composite Resistant Coating Process. Details of a process for applying metal and ceramic coatings resulting from research by the Vitro Corporation of America. *Metalworking Production*, v. 102, no. 44, Oct. 31, 1958, p. 1919-1921.

1460* The Evaporation of Solvents From Coatings. I. Method of Measurement. Evaporation rate for a given coating has been found to be a function of total coating weight, film thickness, and to be dependent upon other factors, such as relative humidity. A system for analyzing evaporation rate data is presented. ***E. G. Shur.*** *Official Digest*, v. 30, Nov. 1958, p. 1203-1231.

1461* Pigment Optical Behavior—Evaluation on a Physical Basis. A workable system of pigment optics based on Kubelka-Munk theory is described for evaluating pigmentations in terms of physically significant quantities. ***Parker B. Mitton and Lawrence S. White.*** *Official Digest*, v. 30, Nov. 1958, p. 1259-1276.

1462 The Function of Aluminium Complexes as Structure-Modifiers for Paint. ***J. H. W. Turner, S. G. Kemp, and S. E. Harson.*** *Oil & Colour Chemists' Association, Journal*, v. 41, Nov. 1958, p. 769-779.

1463 Polyvinyl Acetate Emulsion Paints: Solved and Unsolved Problems. Studies of polyvinyl acetate emulsion paints, carried out at the Paint Research Station, are summarized, and some outstanding matters indicated. The problems range from the initial polymerization of the monomer, through the problems of the liquid paint, to the film formation process and the properties of the film. ***L. A. O'Neill.*** *Oil & Colour Chemists' Association, Journal*, v. 41, Nov. 1958, p. 780-796.

1464 Aircraft Finishing. Attempts to show the accepted procedures and at the same time indicate some of the developments being studied and solved. Many of these are only a start in the anticipated problems of the fast approaching Space Age. ***Norman I. Gaynes.*** *Plating*, v. 45, Nov. 1958, p. 1133-1135.

1465* Chromate Conversion Treatments. I. Development and applications. ***D. J. Fishlock.*** *Product Finishing*, v. 11, Nov. 1958, p. 53-62.

1466 A Review of Organic Coatings. A description of organic coatings commonly used by industry today, together with a discussion of the properties of each. ***Harold A. Pollay.*** *Products Finishing*, v. 23, no. 2, Nov. 1958, p. 50-55.

See also: **1331** (salicylanilide in varnishes); **1336** (metal content of paint driers); **1347** (epoxy resin spot test); **1741** (chemical conversion coatings for Ti); **1915** (cadmium coatings on high strength steel); **2235** (torsional oscillation measurement of rheology of polymer films).

CONTROL SYSTEMS, COMPUTERS, AND SYSTEMS ENGINEERING

1467 Subharmonic Oscillations of Nonlinear Feedback Control Systems. The non-linearities treated in this paper are those whose input-output characteristic curves show saturating or limiting characteristics and are skew symmetric with respect to their origins. The analysis show that the outputs of such nonlinear systems will oscillate either with the input frequencies or with odd order subharmonics of the input frequencies. Also presents a design aid for eliminating the possibility of subharmonic oscillations. ***Katsuhiko Ogata.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1802-1808.

1468 Optimal Synthesis of Linear Sampling Control Systems Using Generalized Performance Indexes. Deals with the design of linear control systems so as to minimize some quadratic performance index. The method of design is applicable to both sampling and continuous control systems. Using the concepts of "state" and "transition matrix" the design problem can be solved, via the technique of dynamic programming, by means of simple iterative computations. ***R. E. Kalman and R. W. Koepcke.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1820-1826.

1469 Time Domain Synthesis of Sampled-Data Control Systems. Application of the modified-z-transform to synthesis of sampled-data control systems. The synthesis procedure presented is a time domain technique which permits the designer to achieve control of the continuous behavior of the system. The desired characteristics are specified in terms of standard synthesis criteria, and from such specifications the required compensation transfer functions are determined. ***E. I. Jury and F. W. Semelka.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1827-1838.

1470 Continuous Measurement of Characteristics of Systems With Random Inputs: A Step Toward Self-Optimizing Control. A new technique is presented whereby changes in system parameters are detected from changes in the moments of the system impulse response. At the same time, changes in input statistical properties are detected by changes in the moments of the input autocorrelation function. ***T. P. Goodman and R. H. Hillsley.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1839-1848.

1471* A Dual Master File System for a Tape Processing Computer. ***Sherman Blumenthal.*** *Association for Computing Machinery, Journal*, v. 5, no. 4, Oct. 1958, p. 319-327.

1472* The Application of Sequential Estimation to Computer Simulation and Monte Carlo Procedures. ***Jack Moshman.*** *Association for Computing Machinery, Journal*, v. 5, no. 4, Oct. 1958, p. 343-352.

1473 Digital Computer Simulation Techniques. Some timely applications of digital simulation are discussed. ***Dimitris N. Chorafas.*** *Automatic Control*, v. 9, no. 5, Nov. 1958, p. 61-69.

1474* Using Data Reduction for Continuous Processes. If optimum performance is to be obtained from a production system, up-to-the-minute information is required by operators and managers so that more efficient and profitable use can be made of production facilities. Data reduction helps toward this goal. ***W. E. Chope.*** *Automation*, v. 5, Nov. 1958, p. 42-46.

1475* Reduce Downtime by Counteracting Voltage Dips in Industrial Controls. ***G. W. Heumann.*** *Automation*, v. 5, Nov. 1958, p. 60-65.

1476* Building-Block Controls. Discussion of concept which provides an economical solution to the problem of obtaining custom controls. ***W. C. Leone.*** *Automation*, v. 5, Nov. 1958, p. 75-80.

1477* On Existence of a Cycle Beyond Absolute Stability Conditions of a Three-Dimensional System. Beyond absolute stability conditions of a closed-loop system with neutral object and regulator having non-linear velocity of controls resetting there always exists a non-trivial (periodical, in particular) stable regime. Physical interpretations of the system. (*In Russian.*) O sushchestvovanii tsikla vne uslovíĭ absoliutnoĭ ustoĭchivosti trekhmernoĭ sistemy. ***B. V. Shirokorad.*** *Avtomatika i Telemekhanika*, v. 19, no. 10, Oct. 1958, p. 953-967.

1478* Efficiency of Using Frequency Band in Telemetering. Determination of efficiency of using telemetering channels frequency band in various modulation ways is considered. (*In Russian.*) Effektivnost' ispol'zovaniia polosy chastot pri teleizmerenii. ***R. R. Vasil'ev.*** *Avtomatika i Telemekhanika*, v. 19, no. 11, Nov. 1958, p. 1067-1089.

1479 A Team Reports on Control Inside Russia. As representatives of the American Automatic Control Council, the team recently returned from a 16-day visit to Soviet control makers, users, and research labs. ***William E. Vannah.*** *Control Engineering*, v. 5, Nov. 1958, p. 65-70.

1480 Electronic Process Control Systems. Article covers background common denominators and equipment characteristics. ***Harry R. Karp.*** *Control Engineering*, v. 5, Nov. 1958, p. 81-96.

1481* Latching Counters. II. Non-Binary Counters and Transistor Circuits. ***W. P. Anderson and N. A. Godel.*** *Electronic & Radio Engineer,* v. 35, Nov. 1958, p. 425-436.

1482 Control Apparatus for a Serial Drum Memory. This article gives circuit and performance details of the gates, triggers, switches, and other components that have been developed for a faster track switching device for a serial drum memory. ***D. S. Kamat.*** *Electronic Engineering,* v. 30, Nov. 1958, p. 634-639.

1483* Solving Inhomogeneous Systems of Linear Higher-Order Integral-Differential Equations With Constant Coefficients by Electronic D. C. Analog Computers. ***Anton Železnikar.*** *Elektrotehniški Vestnik,* v. 26, nos. 5-6, May-June 1958, p. 11-18.

1484 Handbook of Automation, Computation, and Control. v. I. Control Fundamentals. Practical design data for research, development and design in feedback control, computers, data processing, control components, and control systems. The stress throughout is on new techniques and components for designing, and developing control systems. ***Eugene M. Grabbe, Simon Ramo, and Dean E. Wooldridge, editors.*** Sections individually paged. 1958. John Wiley & Sons, New York. (TA165 H19)

1485 A Business Intelligence System. An automatic system is being developed to disseminate information to the various sections of any industrial, scientific, or government organization. This intelligence system will utilize data-processing machines for auto-abstracting and auto-encoding of documents and for creating interest profiles for each of the "action points" in an organization. Both incoming and internally generated documents are automatically abstracted, characterized by a word pattern, and sent automatically to appropriate action points. This paper shows the flexibility of such a system in identifying known information, in finding who needs to know it and in disseminating it efficiently either in abstract form or as a complete document. ***H. P. Luhn.*** *IBM Journal of Research and Development,* v. 2, no. 4, Oct. 1958, p. 314-319.

1486 Computation in the Presence of Noise. The behavior of a system consisting of a preliminary coder, an unreliable computer, and a decoder is investigated. ***P. Elias.*** *IBM Journal of Research and Development,* v. 2, no. 4, Oct. 1958, p. 346-353.

1487 Machine-Made Index for Technical Literature—An Experiment. Machine techniques for reducing technical documents to their essential discriminating indices are investigated. Human scanning patterns in selecting "topic sentences" and phrases composed of nouns and modifiers were simulated by computer program. The amount of condensation resulting from each method and the relative uniformity in indices are examined. It is shown that the coordinated index provided by the phrase is the more meaningful and discriminating. ***P. B. Baxendale.*** *IBM Journal of Research and Development,* v. 2, no. 4, Oct. 1958, p. 354-361.

1488 Transac C-1100: Transistorized Computers for Airborne and Mobile Systems. A representative problem involving dead-reckoning and VOR-TAC navigation, automatic control of the aircraft, and fuel management illustrates how the computer is programmed. ***Gerhard L. Hollander.*** *IRE Transactions on Aeronautical and Navigational Electronics,* v. ANE-5, no. 3, Sept. 1958, p. 159-169. (TK1 In6.6a Vis.)

1489* Uniform Transient Error. Equations describing error in power-level measurements of transients can be used to compute the design of analyzers so as to distribute transient error in a way compatible with experimental requirements. ***Edith L. R. Corliss.*** *Journal of Research, National Bureau of Standards,* v. 61, no. 1, July 1958, p. 25-30.

1490 Designing Photoelectric Control Systems. ***J. J. Larew.*** *Machine Design,* v. 30, Nov. 27, 1958, p. 90-98.

1491* A Linear Programming Approach to the Chemical Equilibrium Problem. By piece-wise linear approximations to the free energy function, the problem becomes a linear program which can be solved by a standard code on a computing machine. ***George Dantzig, Selmer Johnson, and Wayne White.*** *Management Science,* v. 5, no. 1, Oct. 1958, p. 38-43.

1492* How Fast Can Computers Become? Thoughts on future possibilities in computer design. ***R. L. Grimsdale.*** *Process Control and Automation,* v. 5, Nov. 1958, p. 444-447.

1493* How to Improve the Controllability of a System by Introducing Cascade Control. The author demonstrates that, the greater the gain of the auxiliary control loop, the more pronounced is the favorable effect of cascade control on the transit behavior of the control loop. (*In German.*) Die Verbesserung der Regelfähigkeit eines Systems mit Hilfe der Kaskadenregelung. ***Th. Ankel and K. Hengst.*** *Regelungstechnik,* v. 6, no. 10, 1958, p. 361-366.

1494 Telemetering the Explorer. Scientific satellites are only as good as the new knowledge we gain with their help—most of which is based on telemetered data. The telemetry link therefore is one of the cornerstones on which our space flight program must be built. ***Joseph F. Koukol.*** *Space/Aeronautics,* v. 30, no. 5, Nov. 1958, p. 190-198.

See also: **1579** (digital computers); **2377** (automatic welding).

ELECTRICAL ENGINEERING

1495 Methods of Arbitrary Function Generation. II. This part continues the discussion of photoelectric function generators. ***Barbara Silverberg.*** *Automatic Control,* v. 9, no. 5, Nov. 1958, p. 6-9.

1496* The Effect of the Iron and Secondary Windings on the Current and Voltage During Surges in Transformer Windings. ***M. Christoffel.*** *Brown Boveri Review,* v. 45, no. 6, June 1958, p. 254-262.

1497 A Comprehensive Study of Magnetic-Amplifier Design. I. A Practical Design Method. II. Toroidal-Core Dimensional Ratios as Factors in Magnetic-Amplifier Design. Introduces a new practical design method using block diagram techniques. Presents a logical method for determining optimum toroidal-core configurations and proposes a list of standard core sizes. ***B. M. Hubbard and M. M. Bishop.*** *Communication and Electronics,* 1958, no. 39, Nov., p. 562-572 and 572-583.

1498 Magnetic Amplifier Bibliography 1951-1956. *Communication and Electronics,* 1958, no. 39, Nov., p. 613-627.

1499 Techniques of Cooling Electronic Equipment. Included here are methods and techniques of temperature measurement and control. ***James P. Welsh.*** *Electrical Manufacturing,* v. 62, Nov. 1958, p. 80 + 8 pages.

1500 Duty-Cycle Motor Selection. The selection of special motors for duty-cycle applications is discussed. ***C. C. Morris.*** *Electrical Manufacturing,* v. 62, Nov. 1958, p. 103 + 3 pages.

1501 A Low-Level, High-Accuracy, D-C Magnetic Amplifier. Magnetic Amplifiers can be used to measure accurately and reliably d-c signal voltages from transducers such as thermocouples, strain gages, etc. One possible advantageous feature is complete electrical isolation between transducer and load. ***Blas A. Mazzeo.*** *Electrical Manufacturing,* v. 62, Nov. 1958, p. 106-110.

1502* Synchronous Compensators for Long - Distance Transmission Systems. Discussion on noncompensated supporting synchronous compensators and on those compensated by capacitance. (*In Russian.*) Sinkhronnye kompensatory dlia dal'nikh elektroperedach. ***A. I. Vazhnov, E. V. Tolvinskaia, I. A. Gordon, D. A Zavalishin, and I. A. Glebov.*** *Elektrichestvo,* 1958, no. 10, Oct., p. 43-47.

1503* On Using the Method of Testing the Individual Arc Extinguishing Elements in High-Voltage Circuit Breakers. Investigation of the effect of statistical character of arc extinguishing process and distribution of recoverable voltage on the operation of the breaker. (*In Russian.*) O primenenii metoda ispytanii otdel'nykh dugogasitel'nykh elementov vysokovol'tnykh

vykliuchateleĭ. ***V. V. Kaplan, and V. M. Nashatyr'.*** *Elektrichestvo*, 1958, no. 10, Oct., p. 59-65.

1504* External Cooling of Oil Transformers. The development of new radiators makes it possible to use larger cooling surfaces in a given structural volume with satisfactory heat flow. Reduction of the number of ventilators by means of horizontal, instead of vertical, blowing. (*In German.*) Äussere Kühlung von Öltransformatoren. ***Viktor Aigner.*** *ETZ: Elektrotechnische Zeitschrift*, v. 79, Ausgabe A, no. 19, Oct. 1, 1958, p. 680-687.

1505 Network Realization of Optimum Amplifier Noise Performance. ***R. B. Adler and H. A. Haus.*** *IRE Transactions on Circuit Theory*, v. CT-5, no. 3, Sept. 1958, p. 156-161. (TK1 In6.6c Vis.)

1506 Synthesis of Lossless Networks for Prescribed Transfer Impedances Between Several Current Sources and a Single Resistive Load. Applications to frequency multiplexing problems, including the design of multichannel amplifiers. ***A. B. Macnee.*** *IRE Transactions on Circuit Theory*, v. CT-5, no. 3, Sept. 1958, p. 168-172. (TK1 In6.6c Vis.)

1507 Axioms on Transactors. ***Gerald E. Sharpe.*** *IRE Transactions on Circuit Theory*, v. CT-5, no. 3, Sept. 1958, p. 189-196. (TK1 In6.6c Vis.)

1508 Size Reduction of Airborne Transformers. The volume and weight of transformers can be reduced by simplifying the design, and by using better application practices and closer mechanical tolerances. ***Ray E. Lee.*** *IRE Transactions on Component Parts*, v. CP-5, no. 3, Sept. 1958, p. 142-147. (TK1 In6.6cp Vis.)

1509* Circuits for Short-Arc Lamps. A new means of predicting reliability of performance of a starting circuit has been established, and a new circuit which overcomes critical features of previous circuits has been developed. ***Theodore C. Retzer.*** *Illuminating Engineering*, v. 53, Nov. 1958, p. 606-612.

1510* A Method of Analysis of Transformer Impulse Voltage Distribution Using a Digital Computer. The paper presents a method of calculation which appears sufficiently accurate and flexible to provide a basis for a routine design procedure. ***Beryl M. Dent, E. R. Hartill, and J. G. Miles.*** *Institution of Electrical Engineers, Proceedings*, v. 105, pt. A, no. 23, Oct. 1958, p. 445-459.

1511 What's New in Electrical Insulation. New materials and other developments aimed at meeting the increasing capacity and operating temperatures of electrical equipment. *Materials in Design Engineering*, v. 48, Nov. 1958, p. 108-113.

1512 Noise, A General Survey. A review of the advances made in understanding the phenomena which give rise to reception disturbances in telecommunication engineering, and which are collectively called "noise". ***K. S. Knol.*** *Philips Technical Review*, v. 20, nos. 2/3, Oct. 1958, p. 50-57.

1513* Control of the Speed of Rotation of a D. C. Motor Without a Tachometer Generator. A quantitative derivation of the dynamic differences is given and rules are established for optimizing the control of the speed for motor back E.M.F. systems, both for Ward-Leonard Sets and direct armature feed of the motor via a magnetic amplifier. (*In German.*) Drehzahlregelung eines Gleichstrommotors ohne Tachomaschine. ***D. Ströle.*** *Regelungstechnik*, v. 6, no. 10, 1958, p. 356-358.

1514 Bridge Method for Microwave Dielectric Measurements. A method for measuring complex dielectric constants of liquids is described. It involves the variation of the length of a short-circuited section of transmission line until its input admittance is solely resistive. A novel microwave bridge indicates when this condition is fulfilled and simultaneously measures the admittance. From a knowledge of this admittance and the length of the dielectric-filled section the complex dielectric constant may be readily calculated. Measurements at 1 and 3 kMc with several liquids of diverse dielectric character are in satisfactory agreement with values reported elsewhere. ***Sivert H. Glarum.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 1016-1019.

1515 Half-Megampere Magnetic-Energy-Storage Pulse Generator. Energy is stored in the magnetic field of a large air-core transformer having a very low impedance, tightly coupled secondary winding. The energy can be effiectively delivered in less than 5 msec to a noninductive load, having a resistance of less than 10^{-4} ohm. ***R. C. Walker and H. C. Early.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 1020-1022.

1516 Liquid-Cooled Generators for Mach 1+. This article explains that aircraft generator designers must switch over to liquid-cooled units. ***D. A. Wilhelmson.*** *Space/Aeronautics*, v. 30, no. 5, Nov. 1958, p. 64-69.

See also: **1282** (dielectric loss of glass); **1285** (ceramic insulators); **1567** (papers submitted to 12th General Assembly of International Scientific Radio Union); **2241** (electrical properties of epoxies); **2243** (electrical properties of casting resins).

ELECTROCHEMISTRY

1517 Local Cell Action During the Scaling of Metals. II. Electrochemical measurements show that the reaction is controlled mainly by polarization of the cathode where oxygen molecules are reduced to ions. ***Christa-Ilschner-Gensch.*** *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 635-638.

1518 Anodic Oxide Film Formation on Zirconium Kinetics With and Without Concurrent Oxygen Evolution. Results confirm the view that the metal is anodically oxidized to the corresponding oxide at unit current efficiency below the reversible oxygen evolution potential. ***George B. Adams, Jr., Tien-Shuey Lee, Samuel M. Draganov, and Pierre Van Rysselberghe.*** *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 660-665.

1519 Electrochemical Calorimetry. Equations are derived which show the relation between polarization and the other heat-producing phenomena in electrolytic cells. ***J. M. Sherfey and Abner Brenner.*** *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 665-672.

1520 Cathode Potentials During the Electrodeposition of Molybdenum Alloys From Aqueous Solutions. A two-step mechanism for the reduction of molybdate ion in the presence of a codepositing metal proposed and an explanation of why this metal must be Fe, Co, or Ni rather than such metals as Cr, Mn, Cu, or Zn is presented. ***D. W. Ernst and M. L. Holt.*** *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 686-692.

1521 Some Developments in Barrel Nickel Plating. Increasing both the speed and quality of nickel plating carried out in submerged and partially submerged barrels. ***B. E. Bune.*** *Electroplating and Metal Finishing*, v. 11, Nov. 1958, p. 389-397.

1522 The Electrochemical Industry—Fifty Years of Progress. Reviews developments in the past 50 years in the fields of industrial electrolysis, electroplating, electrowinning and electrorefining, electrothermics, electroorganics, batteries, and electronic applications. Forecasts continued progress in these and other fields, especially in applications in nuclear materials and fuel cells, and along lines predicted by theoretical electrochemistry. ***Charles L. Faust and L. D. McGraw.*** *Industrial and Engineering Chemistry*, v. 50, Nov. 1958, p. 46A-49A.

1523 Electroforming With Plating Cells. Small truncated wedges were formed using a modification of the Walton-Gilmont cell. Validity at cell design was tested by the method at Kinney and Festa. ***E. B. Saubestre.*** *Metal Finishing*, v. 56, Nov. 1958, p. 62 + 1 page.

1524* Nickel Plating and Its Industrial Applications. (*In French.*) Le nickelage et ses applications industrielles. ***H. C. Castell.*** *Métaux Corrosion-Industries*, v. 33, Sept. 1958, p. 366-376.

1525 Drapery Hardware Finished by Plating and Painting. Zinc plating steel strip stock, phosphatizing, then forming and

paint finishing. ***Ezra A. Blount.*** *Products Finishing*, v. 23, no. 2, Nov. 1958, p. 36-45.

See also: **1386** (electrochemical characterization of organic compounds).

ELECTRONICS

1526 Signal Detection as a Function of Frequency Ensemble. I. This paper presents the results of an experimental investigation of the detection of a signal in noise as a function of signal ensemble size and ensemble frequency range. ***Florence A. Veniar.*** *Acoustical Society of America, Journal*, v. 30, Nov. 1958, p. 1020-1024.

1527 Correlation With Similar Uniform Collinear Arrays. This report is concerned with the nature of the mean output of a single correlator receiving system when the input is a narrow frequency band signal arising from a localized source in space. ***Melvin J. Jacobson.*** *Acoustical Society of America, Journal*, v. 30, Nov. 1958, p. 1030-1034.

1528* Effects of a Signal Band With Amplitude Modulation by Means of Unsymmetrical High Frequency Circuits. The influence of RF stages on the demodulated signal with amplitude modulation is investigated under the assumption that the two band halves have an unsymmetrical amplitude and phase response with frequency. (*In German.*) Beeinflussung eines Nachrichtenbandes bei Amplitudenmodulation durch unsymetrische Hochfrequenzkreise. ***Rudolf Hofer.*** *Archiv der Elektrischen Übertragung*, v. 12, Sept. 1958, p. 381-393.

1529* Propagation of Fundamental Modes in Circular and Square Waveguides of Constant Curvature. (*In German.*) Ausbreitung von Grundwellen in kreisrunden und quadratischen gebogenen Hohlleitern konstanter Krümmung. ***Mogens G. Andreasen.*** *Archiv der Elektrischen Übertragung*, v. 12, Sept. 1958, p. 414-418.

1530* Contactless Relay With Transistors. The paper deals with a contactless relay with transistors that is constructed in correspondence with the d-c two-cascade amplifier having a deep positive feedback. (*In Russian.*) Beskontaktnoe rele na poluprovodnikovykh triodakh. ***F. L. Varpakhovskii and R. A. Lipman.*** *Avtomatika i Telemekhanika*, v. 19, no. 11, Nov. 1958, p. 1027-1035.

1531 Helix Waveguide Theory and Application. Generalized telegraphist's equations have been derived for curved helix waveguide and coefficients obtained for conversion from normal modes of the helix waveguide to normal modes of the metallic waevguide. A radical wave impedance at the helix interface is used to calculate the effect of composite jacket structures. Three different applications of the helix waveguide for circular electric wave transmission are discussed. ***Hans Georg Unger.*** *Bell System Technical Journal*, v. 37, no. 6, Nov. 1958, p. 1599-1647.

1532 Attenuation of the Te_{01} Wave Within the Curved Helix Waveguide. In this paper formulae for the curvature attenuation caused by the dielectric losses are given. It is shown that the attenuation due to curvature can be remarkably reduced by proper choice of the thickness of the dielectric layer between helix and metallic shield. ***D. Marcuse.*** *Bell System Technical Journal*, v. 37, no. 6, Nov. 1958, p. 1649-1662.

1533* New Developments in Silicon Photovoltaic Devices. The requirements which silicon photovoltaic devices have to meet in various applications are so widely different that it was necessary to develop three distinct types of devices. The spectral response, transient response, and temperature dependence of these devices are considered. ***M. B. Prince and M. Wolf.*** *British Institution of Radio Engineers, Journal*, v. 18, Oct. 1958, p. 583-595.

1534* Electromagnetic Wave Propagation in Cylindrical Waveguides Containing Gyromagnetic Media. A large number of computed results of cut-off points and phase constants for the case of a guide containing a concentric ferrite rod of arbitrary radius. ***R. A. Waldron.*** *British Institution of Radio Engineers, Journal*, v. 18, Oct. 1958, p. 597-612.

1535* Thermally Compensated Crystal Oscillators. The paper describes a new approach to the problem of "frequency-versus-temperature" stability. ***R. A. Spears.*** *British Institution of Radio Engineers, Journal*, v. 18, Oct. 1958, p. 613-620.

1536 Spectrum Analysis of Random Noise Generators. Introduces a method for evaluating spectrum shape. Uses one selective filter and a variable chopper carrier for selection of desired frequency within a wide band. ***L. G. Polimerou.*** *Communication and Electronics*, 1958, no. 39, Nov., p. 672-679.

1537 Electronic Materials and Components for Extreme Environmental Problems. Discussion and data on specific materials and components. ***Alex. E. Javitz and Paul G. Jacobs.*** *Electrical Manufacturing*, v. 62, Nov. 1958, p. 111-134.

1538* Narrow-Band Magnetostrictive Filters. Twenty filters, each with a 3-dB bandwidth of 7 c/s, were arranged with inputs in series and outputs isolated from one another. Possible applications of both single resonators and arrays are considered. ***A. P. Thiele.*** *Electronic & Radio Engineer*, v. 35, Nov. 1958, p. 402-411.

1539* Wide-Range RC Oscillator. A novel type of tone-source or oscillator is described; a frequency range of more than 1000 : 1 can be obtained in a single sweep. ***C. G. Mayo and J. W. Head.*** *Electronic & Radio Engineer*, v. 35, Nov. 1958, p. 412-416.

1540 Some Novel Circuits Employing Cold-Cathode Tubes. I. ***R. S. Sidorowicz.*** *Electronic Engineering*, v. 30, Nov. 1958, p. 624-629.

1541 The Effect of a Magnetic Field on Point-Contact Transistors. Interesting observations have been made of the alterations of all the characteristics of the transistor, both static and dynamic. ***K. K. Bose.*** *Electronic Engineering*, v. 30, Nov. 1958, p. 639-641.

1542 Time-Symmetric Filters. In general, the envelope of the response is symmetrical, and reaches a maximum at the time when the frequency of the tone is equal to the resonant frequency of the filter. This behavior contrasts with that of a simple tuned circuit. ***L. R. O. Storey and J. K. Grierson.*** *Electronic Engineering*, v. 30, Nov. 1958, p. 648-653.

1543 The Radio Spectrum. A summation of the many-sided problem of frequency allocations. ***T. A. M. Craven.*** *Electronic Industries*, v. 17, Nov. 1958, p. 02 + 5 pages.

1544 Predicting Accurate Radar Ranges. Radar range can be accurately and quickly calculated from a chart based on known equipment parameters. ***Leo Young.*** *Electronic Industries*, v. 17, Nov. 1958, p. 58-61.

1545 Microwave Power Tubes—A Survey. Technical specifications are given for over 800 tubes now available covering the microwave spectrum, including the long-established klystrons and magnetrons, and the family of wave tubes, traveling wave and backward wave. *Electronic Industries*, v. 17, Nov. 1958, p. 103 + 16 pages.

1546 The Future With Solid State Devices. I. ***Joseph B. Brauer.*** *Electronic Industries*, v. 17, Dec. 1958, p. 58-61.

1547 Staggered Rep Rate Fills Radar Blind Spots. Limitations of a moving-target-indicator radar system are investigated and a staggered prf circuit described. Clutter fluctuation in staggered prf is compared with response to clutter fluctuation in a convention mti system. ***S. E. Perlman.*** *Electronics*, (Engineering Edition), v. 31, no. 47, Nov. 21, 1958, p. 82-85.

1548 Boosting Power Transistor Efficiency. Precise control of transistor instantaneous voltage and current produces operating efficiencies that approach the ideal. ***John W. Caldwell and T. C. Gordon Wagner.*** *Electronics*, (Engineering Edition), v. 31, no. 47, Nov. 21, 1958, p. 86-88.

1549 Tones Find Data in High-Speed Tape Systems. Tone modulated recording and signal integration recovery techniques

permit reliable operation regardless of tape defects. ***Reuben Wasserman and Paul Hurney.*** *Electronics*, (Engineering Edition), v. 31, no. 47, Nov. 21, 1958, p. 92-95.

1550* Frequency Range and Effectiveness of Short Directional Antenna Systems. ($h < \lambda/10$). Investigation of linear, folding, and frame antennas of different diameters with and without a capacity roof as polydirectional single antennas and as beam radiation coupling antennas. Calculation of the frequency range by means of resistance variation during detuning. (*In German.*) Bandbreite und Wirkungsgard kurzer Antennensysteme. ($h < \lambda/10$) ***H. E. Fröling.*** *Frequenz*, v. 12, Sept. 1958, p. 273-284.

1551* Dimensioning Low Noise Level Input Stages of Low Frequency Amplifier With Transistor OC 603. Best control is obtained by means of high amplification and low noise power. Calculation of this power and of the optimum generator internal resistance at a given frequency and a given working point, by means of the curves of two measured noise values. (*In German.*) Dimensionierung rauscharmer Eingangsstufen von NF-Verstärkern mit Transistor OC 603. ***J. Schubert.*** *Frequenz*, v. 12, Sept. 1958, p. 285-293.

1552* Orthogonic Capacitive Goniometer. To avoid direction-finding errors, the coupling capacities between rotor and stator must depend sinusoidally upon the angle of rotation. Structural requirements in erecting a goniometer. (*In German.*) Winkeltreue kapazitive Goniometer. ***G. Ziehm.*** *Frenquenz*, v. 12, Sept. 1958, p. 293-299.

1553 Channels With Side Information at the Transmitter. In this paper a type of channel with side information is studied and its capacity determined. ***C. E. Shannon.*** *IBM Journal of Research and Development*, v. 2, no. 4, Oct. 1958, p. 289-293.

1554 Transfluxor Controlled Electroluminescent Display Panels. The feasibility of displaying images according to electrical signals using an array of electroluminescent cells magnetically controlled has been demonstrated by a working model. ***J. A. Rajchman, G. R. Briggs, and A. W. Lo.*** *I.R.E. Proceedings*, v. 46, Nov. 1958, p. 1808-1824.

1555 Incoherent Scattering of Radio Waves by Free Electrons With Applications to Space Exploration by Radar. ***W. E. Gordon.*** *I.R.E. Proceedings*, v. 46, Nov. 1958, p. 1824-1829.

1556 Analysis of Millimicrosecond RF Pulse Transmission. Quadratic approximations for the complex propagation constant are used, and a Gaussian pulse envelope is assumed. ***Max P. Forrer.*** *I.R.E. Proceedings*, v. 46, Nov. 1958, p. 1830-1835.

1557 Some Generalized Scattering Relationships in Transhorizon Propagation. An analysis is made of the consequences to be derived from some fairly broad assumptions as to the nature of turbulent scattering and its effect on waves propagated through the troposphere. ***A. T. Waterman, Jr.*** *I.R.E. Proceedings*, v. 46, Nov. 1958, p. 1842-1848.

1558 Matrix Analysis of Oscillators and Transistor Applications. ***A. J. Cote, Jr.*** *IRE Transactions on Circuit Theory*, v. CT-5, no. 3, Sept. 1958, p. 181-188. (TK1 In6.6c Vis.)

1559 Theory of Low-Distortion Reproduction of FM Signals in Linear Systems. ***Elie J. Baghdady.*** *IRE Transactions on Circuit Theory*, v. CT-5, no. 3, Sept. 1958, p. 202-214 (TK1 In6.6c Vis.)

1560 History, Present Status, and Future Developments of Electronic Components. ***Paul S. Darnell.*** *IRE Transactions on Component Parts*, v. CP-5, no. 3, Sept. 1958, p. 124-129. (TK1 In6.6cp Vis.)

1561 Intermetallic Semiconductors. The intermetallic semiconductors indium, antimonide, indium arsenide, indium phosphide, gallium arsenide, cadmium telluride, mercuric telluride, and bismuth telluride are discussed. Methods of synthesis, purification and single crystal growth, are described. Interesting properties of these compounds are examined, and some of their applications listed. ***Henry T. Minden.*** *IRE Transactions on Component Parts*, v. CP-5, no. 3, Sept. 1958, p. 129-141 (TK1 In6.6cp Vis.)

1562 General Treatment of Klystron Resonant Cavities. The formulas derived here enable one to calculate the resonant frequency within an error of a few per cent and the shunt resistance and the Q within an error of several tenths of a per cent in most cases, and thus should prove to be very useful to the designer of microwave circuits. ***Kazuo Fujisawa.*** *IRE Transactions on Microwave Theory and Techniques*, v. MTT-6, no. 4, Oct. 1958, p. 344-358.

1563 A Unified Discussion of High-Q Waveguide Filter Design Theory. Design formulas for equal ripple and maximally flat performance are given for the VSWR's of the reflecting elements in terms of dimensionless quantities. Detailed comparison of previous formulas is made. ***Henry J. Riblet.*** *IRE Transactions on Microwave Theory and Techniques*, v. MTT-6, no. 4, Oct. 1958, p. 359-368.

1564 Microwave Semiconductor Switching Techniques. This paper describes new microwave techniques employing the properties of N-type germanium diode switches. ***R. V. Garver, E. G. Spencer, and M. A. Harper.*** *IRE Transactions on Microwave Theory and Techniques*, v. MTT-6, no. 4, Oct. 1958, p. 378-383. (TK1 In6.6mt Vis.)

1565 An Investigation of the Properties of Germanium Mixer Crystals at Low Temperatures. Experimental determinations of the noise temperature ratio, IF resistance, and conversion loss if IN263 germanium mixer diodes operated in an X-band receiver are presented as a function of mixer temperature for the range −196 C to 27 C. ***L. K. Anderson and A. Hendry.*** *IRE Transactions on Microwave Theory and Techniques*, v. MTT-6, no. 4, Oct. 1958, p. 393-398. (TK1 In6.6mt Vis.)

1566 High-Power Microwave Filters. The design procedure for a multielement filter is described utilizing a partly graphical approach. ***Joseph H. Vogelman.*** *IRE Transactions on Microwave Theory and Techniques*, v. MTT-6, no. 4, Oct. 1958, p. 429-439.

1567 XIIth General Assembly. Papers Submitted to the General Assembly. A listing of papers submitted to the 12th General Assembly of the International Scientific Radio Union. *International Scientific Radio Union Information Bulletin*, no. 110, July-Aug. 1958, p. 9-24. (TK6540 In8i Contin.)

1568* An Approximate Theory for Determining the Characteristic Impedances of Elliptic Waveguide. ***R. V. Harrowell.*** *Journal of Electronics and Control*, v. 5, no. 4, Oct. 1958, p. 289-299.

1569* A Relativistic Treatment of Space-Charge Limited Current in a Planar Diode Magnetron Before Cut-Off. Relativistic expressions, correct to first order in a current density parameter, are obtained from two cross-coupled integral equations for the potential functions in a planar diode magnetron. These expressions are evaluated and plotted in two figures, and compared with expressions given by Gold. ***John A. Bradshaw.*** *Journal of Electronics and Control*, v. 5, no. 4, Oct. 1958, p. 300-306.

1570* Wave Matrices Applied to a Periodically Loaded Travelling-Wave Tube. Derives the matrices and an expression for the conditions necessary for this system to oscillate due to feed-back caused by reflections from the periodic discontinuities. ***D. E. T. F. Ashby.*** *Journal of Electronics and Control*, v. 5, no. 4, Oct. 1958, p. 338-343.

1571* The Effect of Strain on the Thermoelectric Properties of a Many-Valley Semiconductor. The electrical conductivity and thermoelectric power of a many-valley semiconductor are considered as functions of strain, neglecting all effects other than those due to carrier transfer between valleys. For non-degenerate materials, a general treatment is given and it is shown that the absence of other effects can be checked by the condition that the trace of the conductivity tensor if unaltered by the strain. An estimate of the order of magnitude shows that the effects should be readily measurable in n-type germanium. ***J. R. Drabble.*** *Journal of Electronics and Control*, v. 5, no. 4, Oct. 1958, p. 362-372.

1572* Propagation of Very-Low-Frequency Pulses to Great Distances. A theoretical study. ***James R. Wait.*** *Journal of*

Research, National Bureau of Standards, v. 61, no. 3, Sept. 1958, p. 187-203.

1573* Transmission and Reflection of Electromagnetic Waves in the Presence of Stratified Media. The application of the results to surface-wave propagation over a stratified ground is considered in some detail. ***Jams R. Wait.*** *Journal of Research, National Bureau of Standards*, v. 61, no. 3, Sept. 1958, p. 205-232.

1574 A Method of Correcting for the Response Time Delays of Measuring Equipment. The error due to the response time delay of measuring equipment on a given input waveform is obtained by considering the output response to a unit step input impulse and applying Laplace Transform analysis. Formulae are derived for correcting the error and applied to (a) resistance/capacitor decay curves; (b) the calculation of velocity constants in chemical reaction systems. ***J. A. Sirs.*** *Journal of Scientific Instruments*, v. 35, Nov. 1958, p. 419-422.

1575* Amplitude Modulation in Traveling Wave Tube Phase Modulator. Various effects on amplitude of carrier and each side band are calculated. To decrease modulation, experimental studies are performed by using the 1st anode to compensate it and a satisfactory improvement has been obtained. ***Jun-ichi Ikenoue and Kenzo Imai.*** *Kyoto University, memoirs of the Faculty of Engineering*, v. 20, pt. 3, July 1958, p. 211-224.

1576 A Flush-Mounted Runway Antenna for the ILS Glide Path. Comparison is made between the TE traveling-wave antenna and an ideal glide-path antenna. Also with the formerly used 8-element Yagi one wavelength above ground. The traveling-wave antenna gives adequate signal in space for use in the glide-path system. Four dielectric fillers are discussed. ***R. H. McFarland and J. R. Baechle.*** *Ohio State University, Engineering Experiment Station Bulletin* 171, Sept. 1958, 30 pp. (TA21 03b Vis.)

1577 The Deplistor, A Semiconductor Switching Device. A device on near-intrinsic germanium is described which makes use of the depletion region, surrounding an alloy contact, biased in the reverse direction. ***O. W. Memelink.*** *Philips Research Reports*, v. 13, no. 5, Oct. 1958, p. 485-488.

1578* Expansion of Operating Frequency Range of Photoelectron Amplifiers. Methods for elimination of auto-oscillations and expansion of operating band and circuits of correcting systems which can be successfully used for photoelectron and other galvanometric dc amplifiers. (*In Russian.*) Rasshirenie rabochego diapazona chastot fotoelektronnykh usiliteleĭ. ***A. V. Lashas and A. A. Nemura.*** *Priborostroenie*, 1958, no. 10, Oct., p. 11-15.

1579* The Use of Transistors in Digital Computers. An introduction to the switching properties of the transistor, and a discussion on various approaches to computer switching circuit design. ***A. R. Boothroyd.*** *Process Control and Automation*, v. 5, Nov. 1958, p. 448-454.

1580 Progress in Semiconductors. Seven papers on research topics. ***Alan F. Gibson, R. E. Burgess, and P. Aigrain, editors.*** v. III. 210 pp. 1958. John Wiley & Sons, New York. (TK3376 P94 Vis.)

1581* On the Theory of Anisotropic Obstacles in Waveguides. Variational principles for the approximate computation of the elements of the scattering matrix for anisotropic obstacles in waveguides are presented. ***Walter Hauser.*** *Quarterly Journal of Mechanics and Applied Mathematics*, v. 11, pt. 4, Nov. 1958, p. 427-437.

1582 Microwave Double-Sweep Method for Analysis of Time-Dependent Cavity Characteristics. The impedance of a microwave cavity whose characteristics are time-dependent, as caused for example by a contained gaseous discharge afterglow, can be examined by means of a frequency-modulated search signal and a swept receiver. ***Stanley Ruthberg.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 999-1003.

1583 Radar Observations of the Russian Earth Satellites and Carrier Rocket. The present paper is confined to a discussion of the results up to the date of burn-up of the carrier rocket of satellite I on Dec. 1, 1957. *Royal Society, Proceedings*, v. 248, ser. A, Oct. 28, 1958, p. 24-33 + 2 plates.

1584 Centimetric Radar Observations of the Russian Satellites. In this paper the reasons for choosing the wavelength of 10 cm. are considered, and the capabilities of a radar of this type in contributing to the I.G.Y. observations are discussed. The results obtained from Oct. 30 to Dec. 1, 1957, are described. ***J. S. Hey and V. A. Hughes.*** *Royal Society, Proceedings*, v. 248, ser. A, Oct. 28, 1958, p. 34-43 + 2 plates.

1585* The Northern Lights and Northern Communications. Visual, radio, and radar observations of aurora. ***A. M. Peterson.*** *SRI Journal*, v. 2, no. 2, 1958, p. 46-51.

1586 The Maser. ***James P. Gordon.*** *Scientific American*, v. 199, no. 6, Dec. 1958, p. 42-50.

1587* Sonar and the Fourth Dimension. This paper discusses several types of fleet sonar equipment in current use. Fundamentals of transducer design are outlined. Directional and range characteristics of underwater sound propagation are analyzed. ***George Rand.*** *Sperry Engineering Review*, v. 11, no. 3, Oct. 1958, p. 2-14.

1588* Standard Parts for Reliability. The great quantity of electronic component parts, such as resistors, capacitors, relays, connectors, etc., pose a major problem to the design engineer from the standpoint of system failure. ***Joseph J. Drvostep.*** *Sperry Engineering Review*, v. 11, no. 3, Oct. 1958, p. 15-20.

1589* The Radar Interference Problem. This paper surveys some of the aspects of this problem in both the frequency and time domains, and suggests a number of avenues of solution. ***Kenneth H. Chase and Sheldon O. Newman.*** *Sperry Engineering Review*, v. 11, no. 3, Oct. 1958, p. 21-27.

1590* Simplified Radar Performance Testing. This paper describes two testing devices. Basic design principles are reviewed, and general operating procedures are outlined. ***George Pate.*** *Sperry Engineering Review*, v. 11, no. 3, Oct. 1958, p. 34-40.

1591 Semiconductor Surface Phenomena. ***Abraham Many.*** *Sylvania Technologist*, v. 11, no. 4, Oct. 1958, p. 117-124.

1592 An Orally Administered Intestinal Radio Transmitter, an Example of Modern Engineering Application to Medicine. Description of a transistor transmitter, 8 mm. in diameter and 26 mm. in length. The 1900 kilocycle frequency varies according to the pressure or acidity recorded, of the stomach or intestine and on the basis of resonance-circuit self-inductance. (*In German.*) Der verschluckbare Intestinalsender ein Beispiel für den Einsatz moderner Technik in der Medizin. ***M. v. Ardenne.*** *Technik*, v. 13, Sept. 1958, p. 614-616.

1593 Semiconductor Devices Research Program. Fabrication of silicon power transistors using gallium and phosphorus as impurities. ***James E. Keister.*** *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 57-618, July 1958, 140 pp. (TL507 Un3.18w Vis.)

1594* Up to Date High Frequency Transistors. Single crystal growing with variable rate of pulling; the methods of the "reverse" melting; inner diffusion. Surface triodes; semiconductors triodes. (*In Russian.*) Sovremennye vysokochastotnye tranzistory. ***Iu. S. Riabinkin.*** *Uspekhi Fizicheskikh Nauk*, v. 65, no. 4, Aug. 1958, p. 689-719.

See also: **1194** (direction-finding observations on artificial earth satellites); **1216** (wide-range radar); **1505** (amplifierf noise performance); **1506** (multichannel amplifiers); **1673** (color television); **1735** (vacuum maintenance in electron tubes); **1969** (assembly of transistors); **2061** (radiation damage in semiconductors); **2372** (brazing of electron tubes); **2384** (welding in transistor manufacture).

ENGINEERING ECONOMICS

1595 Can Inflation Be Controlled? Deals with the wide variations in the general level of commodity prices in modern times. Explains the problem's position in history. ***Harold G. Moulton.*** 302 pp. 1958. Anderson Kramer Associates, Washington, D. C. (HG229 M86c)

1596* Global Energy Sources and Their Depletion. ***C. C. Furnas.*** *Chemistry in Canada*, v. 10, Nov. 1958, p. 32-36.

1597 A Control Engineer's Guide to the Financial Factors of Modernization. Factors that affect the decision to replace equipment. There's special emphasis on depreciation, what it is, how it's figured, and its relationship to modernization; the problem of raising capital for new equipment; and the question of rental versus purchase of equipment. ***Lewis H. Young.*** *Control Engineering*, v. 5, Dec. 1958, p. 66-67.

1598 Determining Process Unit Operating Costs. In the early stages of an experimental program, a unit cost study can determine the advisability of further experimental work on any or all of the process units, and, upon commercial realization of the process, it can develop cost data pertaining to operation of the individual units of the process. ***Sidney Katell and T. J. Joyce.*** *Cost Engineering*, v. 3, no. 4, Oct. 1958, p. 103-108.

1599 Industry's War on Wear. Today, to protect its investments in costlier, more complex production equipment, top management itself is considering ways to improve maintenance. ***Melvin Mandell.*** *Dun's Review and Modern Industry*, v. 72, no. 5, Nov. 1958, p. 46 + 6 pages.

1600* EEI Reports on USSR's Power Picture. U. S. delegation finds Soviet power industry one of fastest growing in the world despite some snags in meeting goals. *Electrical World*, v. 150, Nov. 10, 1958, p. 60-62.

1601* Profitable Research Planning. . . . results in a consistent return for a business. A tabulated procedure is given. ***R. W. Race.*** *Frontier*, v. 21, no. 3, Winter 1958, p. 14-17.

1602* Industrial Mineral Resources of the Western States. ***Richard M. Foose.*** *Mining Congress Journal*, v. 44, Nov. 1958, p. 87-90.

1603* Comparative Studies of Economic Efficiency in the Iron and Steel Industry. Bloomery rotary kiln versus low shaft furnace, pig iron production. (*In German.*) Über Wirtschaftlichkeitsvergleiche in der Eisen-und Stahlindustrie. ***Gerhard Winkler.*** *Neue Hütte*, v. 3, Sept. 1958, p. 543-549.

1604 Estimated Unit Cost of Cobalt From a Cobalt-60 Production Reactor. Cost is $0.94 or $1.02 per curie, depending on mode of operation. U. S. *Atomic Energy Commission, IDO*-10034, Oct. 20, 1957, 7 pp. (UF767 Un3.1id Contin.)

See also: **1295** (lightweight aggregate industry of Florida); **1627** (economic trends in fuels).

FLUID MECHANICS

1605 Three-Dimensional Laminar Boundary Layer in Curved Channel With Acceleration. A theory is developed for two families of three-dimensional laminar boundary layers; the boundary layer on the plane end wall of a concentric circular-arc channel having a particular family of accelerated or decelerated main flows; and the boundary layer on the parallel plane end walls of a curved channel with logarithmic spiral side walls. ***Yasutoshi Senoo.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1721-1733.

1606 Rearrangement of the Temperature Field in Flow Around a Bend. Temperature and velocity field are reported for a specific duct geometry which bends the flow by 90° and simultaneously accelerates it to an average exit velocity which is twice the inlet velocity. The measurements show that the temperature field existing in a cross section upstream of the bend is considerably rearranged by the action of the secondary flow. ***E. R. G. Eckert and T. F. Irvine, Jr.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1765-1772.

1607 Gyro-Integrating Mass Flowmeter. Describes an integrating mass flowmeter designed for high-pressure natural-gas metering. The meter described provides direct reading of pounds of gas on a cyclometer register as well as electrical contacts for remote telemetering mass flow. No electronic elements are used in the design. ***L. T. Akeley, L. A. Batchelder, and D. S. Cleveland.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1849-1854.

1608 Theoretical Analogies Between Heat, Mass and Momentum Transfer and Modifications for Fluids of High Prandtl or Schmidt Numbers. Analogies for turbulent flow inside smooth round tubes are reviewed in detail; an empirical coefficient in the most promising equation is evaluated experimentally using the first heat transfer data of high accuracy obtained in the region of Prandtl numbers above 100. ***A. B. Metzner and W. L. Friend.*** *Canadian Journal of Chemical Engineering*, v. 36, no. 6, Dec. 1958, p. 235-240.

1609 Flow of Compressible Fluids. Previously derived equations describing compressible flow have been rearranged in terms of known downstream conditions to facilitate determination of unknown upstream conditions. A 650 I.B.M. computor was used to solve the simultaneous equation numerically to permit construction of convenient design graphs in parametric form. ***M. B. Powley.*** *Canadian Journal of Chemical Engineering*, v. 36, no. 6, Dec. 1958, p. 241-245.

1610 To Get Viscosity for a Gas Mixture. Discusses the various estimation methods with which mixture viscosities may be calculated from known pure-component viscosities. ***Wallace R. Gambill.*** *Chemical Engineering*, v. 65, Nov. 17, 1958, p. 157-160.

1611 Magnetogasdynamics of Hypersonic Couette Flow. A very simple pure shear flow, usually called "Couette flow," is investigated. ***Z. O. Bleviss.*** *Journal of the Aero/Space Sciences*, v. 25, Oct .1958, p. 601-615.

1612 An Experimental Study of the Turbulent Boundary Layer Behind the Initial Shock Wave in a Shock Tube. ***Walter A. Martin.*** *Journal of the Aero/Space Sciences*, v. 25, Oct. 1958, p. 644-652.

1613 Water Wave Forces, a Theoretical and Laboratory Study. ***Lennart Rundgren.*** *Kungliga Tekniska Högskolans Handlingar*, no. 122, 1958, 123 pp. (T4 K96t Vis.)

1614 Structure of a Shock Wave in Fully Ionized Hydrogen. The Fokker-Planck equations are used to examine the structure. ***D. A. Tidman.*** *Physical Review*, v. 111, ser. 2, no. 6, Sept. 15, 1958, p. 1439-1446.

1615 Relation Between Time Symmetry and Reflection Symmetry of Turbulent Fluids. An assumption of statistical reflection symmetry is proposed for certain turbulent flows. ***William C. Meecham.*** *Physics of Fluids*, v. 1, no. 5, Sept.-Oct. 1958, p. 408-410.

1616 Properties of Impact Pressure Probes in Free Molecule Flow. An expression has been derived for the mass flow through a circular tube in free molecule flow when the tube and gas are in relative motion. ***E. L. Harris and G. N. Patterson.*** *Toronto University, Institute of Aerophysics, UTIA Report No.* 52, Apr. 1958, 18 pp. (TL570 T64.84a Vis.)

See also: **1676** (boundary layer on a turbine nozzle); **2207** (gas dynamics and magneto-hydrodynamics).

FOOD TECHNOLOGY

1617 Fat Transport Mechanism. Reviews several different mechanisms for the transport of fat in the aqueous medium of the blood. Transporting fatty acids by binding them to albumin

has recently been shown to be of great physiologic significance. The bulk of the serum lipides are carried as large lipoprotein molecules, of which there is a wide spectrum. ***Duncan L. McCollester.*** *American Oil Chemists' Society, Journal*, v. 35, Nov. 1958, p. 602-604.

1618* Sanitary Control in Processing Citrus Concentrates. I. Some Specific Sources of Microbial Contamination From Fruit Bins to Extractors. Each fruit handling operation was investigated to determine its effect on fruit surface contamination. It was found that fruit is recontaminated by bins and flight elevators. The brush washer and chlorinated water rinses effectively reduced fruit surface contamination. The result of these sanitizing operations is minimized, however, if subsequent fruit handling equipment is not kept in a sanitary condition. Slimy fruit sizers, conveyor belts, especially those in the juice room, are all contributing factors. ***D. I. Murdock and Charles H. Brokaw.*** *Food Technology*, v. 12, Nov. 1958, p. 573-576.

1619* The Minor Proteins of Bovine Milk. ***R. McL. Whitney.*** *Journal of Dairy Science*, v. 41, Oct. 1958, p. 1303-1323.

1620* Nutritive Value of Differently Processed Groundnut Meals and the Effect of Supplementation of the Meals With Amino Acids, Antibiotics and Vitamin B_{12}. The thiamine content of groundnut meal was much reduced by high-steam treatment. Supplementation with penicillin at the 0.02% level of the diet improved the nutritional quality of groundnut proteins, but aureomycin at 0.03% and streptomycin at the 0.02% level of the diet were not effective. Vitamin B_{12}, at 45 μg/kg of diet, improved the biological value of raw groundnut protein but had no effect on growth in the paired-feeding test. ***S. Balasundaram, H. R. Cama, D. A. Malik, and C. Venkateshan.*** *Journal of Nutrition*, v. 66, no. 1, Sept. 1958, p. 75-89.

1621 Pesticide Residues in Foodstuffs—Health Hazards & Control Measures. ***S. K. Majumder, M. Srinivasan, and V. Subrahmanyan.*** *Journal of Scientific & Industrial Research*, v. 17A, Sept. 1958, p. 347-350.

1622 Some Nutritional and Allied Problems Confronting the Food Manufacturer: Technological Aspects of Antioxidants. Antioxidants have been found to be useful in some fats and foods and of little value in others. ***C. H. Lea.*** *Journal of the Science of Food and Agriculture*, v. 9, Oct. 1958, p. 621-632.

1623 Production of Mushroom Mycelium by Submerged Cultivation. Satisfactory harvests can be obtained, but flavor, when present, is only weak. Methods for the enhancement of flavor after the harvesting of the mycelium have been tried but have been unsuccessful. ***B. P. Eddy.*** *Journal of the Science of Food and Agriculture*, v. 9, Oct. 1958, p. 644-649.

1624* The Contamination of Bacon by Arsenic From Smoke Derived From Preservatized Wood. The contamination of bacon during five hours smoke curing in a pilot plant with smoke obtained from arsenic-treated sawdust was found to be 1.3 to 2.3 p.p.m. Arsenic penetrated the bacon to a depth of 3 cm from the exposed meat surface. Negligible penetration occurred from the skin surface. ***C. C. Watson.*** *New Zealand Journal of Science*, v. 1, no. 3, Sept. 1958, p. 361-368.

1625 Vegetable Oils in Nutrition, With Special Reference to Unsaturated Fatty Acids. ***Dorothy M. Rathmann.*** 70 pp. 1957. Corn Products Refining Co., New York. (QP751 R18v)

See also: **1703** (Russian literature on food technology).

FUELS AND COMBUSTION

1626* The Use of Models for Sudying Flow Processes. Techniques used by the B.C.U.R.A. to study the flow patterns in models of pilot-scale and industrial equipment are described. *B.C.U.R.A. Quarterly Gazette*, no. 35, 1958, p. 5-9.

1627* The Montreal Power Conference. II. A review of those technical sessions at which the subject of coal, oil and gaseous fuels, and nuclear energy and nuclear fuels ,were discussed. The theme was "economic trends in the production, transportation and utilization of fuel and energy". *Engineer*, v. 206, Oct. 3, 1958, p. 520-523.

1628 Designs for Smoke-Reducing Open Fires. Updraft grates, underfed grates, hopper-fed or coking grates, and downdraft grates are considered but none give ideal performance. ***W. F. B. Shaw.*** *Engineering*, v. 186, Oct. 17, 1958, p. 500-503.

1629 Pulsations in Single-Port Gas-Fired Residential Heating Equipment. A summary of research conducted on combustion oscillations in gas-fired single-port heating units as part of a four-year program on a fundamental study of pulsations and oscillations in gas- and oil-fired heating equipment. The mechanism of oscillations for single-port gas units was found to consist of a vortex-shedding phenomenon at the burner lip coupled with a pressure fluctuation in the heating unit. The natural frequency of the vortex shedding was found to be a function of the average velocity of the combustible gas stream, whereas the frequency of the pressure fluctuations in the heating unit is determined by the resonant frequency of the furnace or boiler. It is the degree of the coupling between these two frequencies when they are together which determines the amplitude of oscillation. Applying the knowledge of the details of the driving mechanism, it is possible to devise more basic means of suppressing oscillations in these units. ***C. F. Speich and A. A. Putnam.*** *Heating, Piping & Air Conditioning*, v. 30, Nov. 1958, p. 139-146.

1630 The Oxidation Mechanism in the Open Hearth Furnace. Deals only with the mechanism and theory of oxidation—particularly of C and Fe during the refining or working period of the heat. ***A. L. Hodge.*** *Iron and Steel Engineer*, v. 35, Nov. 1958, p. 97-100.

1631* Infrared Emission Spectra of Flames Under High Resolution. The spectra of a H-O flame and an oxyacetylene flame were measured in the near infrared region with a high-resolution grating spectrometer. In the region from 3.7 to 4.1μ many lines are observed which have not been classified. They may arise from transitions belonging to the v_2 or v_3 bands of water vapor. The intensity of the first overtone band of CO was increased when a high-frequency discharge was passed through the flame and the infrared CN band was increased in intensity when N_2O was mixed with the acetylene. ***Earle K. Plyer and Eugene D. Tidwell.*** *Journal of Research, National Bureau of Standards*, v. 61, no. 4, Oct. 1958, p. 263-268.

1632 Oil and Gas Developments in Kansas During 1957. ***E. D. Goebel, P. L. Hilpman, A. L. Hornbaker, and D. L. Beene.*** *Kansas, State Geological Survey Bulletin No.* 133, 1958, 264 pp. (TN21 K13b Vis.)

1633* Design of the Combined Dust and Gas Burners With Central and Peripheral Arrangements for Supply of Gas. A method of calculating mixing of a gas with air in high-capacity natural gas burners. (*In Russian.*) Raschety kombinirovannykh pylegazovykh gorelok s tsentral'noĭ i periferiĭnoĭ podacheĭ gaza. ***Iu. V. Ivanov.*** *Teploenergetika*, v. 5, no. 11, 1958, p. 9-13.

1634 Better Coke by Thermal Pretreatment of Coal: Results for Illinois No. 6-, Pittsburgh-, and Mason-Bed Coals. ***F. W. Smith, G. W. Birge, D. E. Wolfson, and D. A. Reynolds.*** *U. S. Bureau of Mines, Report of Investigations* 5418, 1958, 26 pp. (TN21 Un3r Vis.)

1635 Lurgi-Gasifier Tests of Pennsylvania Anthracite. The phenomenal growth in the demand for gas in the heavily populated, industrialized eastern part of the United States has prompted investigation of the technology of coal gasification for the purpose of evaluating the technical and economic factors involved in the use of anthracite as a gasification fuel. ***R. E. Morgan, J. W. Eckerd, J. Ratway, and A. F. Baker.*** *U. S. Bureau of Mines, Report of Investigations* 5420, 1958, 22 pp. (TN21 Un3r Vis.)

See also: **1685** (jet propulsion fuels).

GEOLOGY, GEOPHYSICS, MINERALOGY, AND MINING ENGINEERING

1636* High-Speed Digital Computers in Stratigraphic and Facies Analysis. Procedures for compiling data and designing data cards; a program for computing facies percentages and ratios. ***W. C. Krumbein and L. L. Sloss.*** *American Association of Petroleum Geologists, Bulletin,* v. 42, Nov. 1958, p. 2650-2669.

1637 How Chip Flow Differs When Cutting Rocks. Tunnel driving was greatly speeded by the use of carbide rotary drilling bits. Shot holes were drilled at a rate of 6 ft. per min. in dolomitic limestone. The rate obtainable with pneumatic rock drills would have been about 2 ft. per min. ***R. H. Goodrich and J. B. Lyman.*** *Carbide Engineering,* v. 10, Nov. 1958, p. 18-19.

1638 Blow Charging Ammonium Nitrate. Up to 20% greater loading density and a significant saving in time and effort are advantages offered by a blow-charging machine undergoing tests in the field. *Coal Age,* v. 63, Nov. 1958, p. 86-87.

1639 Ammonium Nitrate and Its Use as a Blasting Agent. Efficient handling and loading of ammonium nitrate-type blasting agent cuts costs at western open-pit mines. ***Donald M. Stromquist.*** *Coal Age,* v. 63, Nov. 1958, p. 104-106.

1640* Combatting Wet Formations While Drilling With Air or Gas. Development and field application of methods for combatting small and intermediate quantities of water is described. ***B. V. Randall, J. J. Lummus, and R. P. Vincent.*** *Drilling Contractor,* v. 14, no. 6, Oct. 1958, p. 69 + 7 pages.

1641* Relative Mobility of the Common Elements in Weathering of Some Schist and Granite Areas. Chemical analyses were made of stream waters and rocks from three local drainage basins within which the rocks are chemically homogeneous. ***D. H. Anderson and H. E. Hawkes.*** *Geochimica et Cosmochimica Acta,* v. 14, no. 3, Sept. 1958, p. 204-210.

1642* The Solusphere—Its Inferences and Study. The solusphere is an attempt to organize processes affecting the chemical quality of land waters into a unified field of science much like the field of marine chemistry. ***F. H. Rainwater and W. F. White.*** *Geochimica et Cosmochimica Acta,* v. 14, no. 3, Sept. 1958, p. 244-249.

1643* Development of Median Elevations in Ocean Basins. Partial results of research supported by the Office of Naval Research and the National Science Foundation. ***H. W. Menard.*** *Geological Society of America, Bulletin,* v. 69, Sept. 1958, p. 1179-1185.

1644* Plastic Deformation of Quartz in Nature. ***S. W. Bailey, R. A. Bell, and C. J. Peng.*** *Geological Society of America, Bulletin,* v. 69, Nov. 1958, p. 1443-1466 + 4 plates.

1645 Relation of Silurian Reefs to Ordovician Structure in the Patoka Oil Area. The results of this study indicate that Kimmswick production might be extended northeastward and southwestward from the Fairman pool. ***Thomas W. Smoot.*** *Illinois State Geological Survey, Circular* 258, 1958, 20 pp. (TN21 IL6.7c Vis.)

1646* The Transport and Handling of Materials in Mines. Organization, principles, and planning for internal transport with due regard to mining schedules and transport roads are discussed with a view to employing modern methods of handling materials. (*In Swedish.*) Transport och hantering av material i gruvor. ***Hans Ahlmann.*** *Jernkontorets Annaler,* v. 142, no. 8, 1958, p. 473-514.

1647* On the Structure and Maintenance of the Mature Hurricane Eye. Attempts to derive the significant features of a mature eye in terms of a simplified model of the physical processes undergone by the air composing it. ***Joanne S. Malkus.*** *Journal of Meteorology,* v. 15, no. 4, Aug. 1958, p. 337-349.

1648* On the Isotropy of Large-Scale Disturbances in the Upper Troposphere. As a preliminary attempt to investigate the applicability of the turbulence theory to the large-scale atmospheric phenomena, the experimental test is made of the isotropy for the large-scale motion of the atmosphere at the 300-mb level. ***Yoshimitsu Ogura.*** *Journal of Meteorology,* v. 15, no. 4, Aug. 1958, p. 375-382.

1649* Spectra of Large-Scale Atmospheric Flow at 300 Millibars. Data at 300 mb for January-February and July-August, 1949, are used to compute spectra of atmospheric turbulence as a function of wave number along various latitude circles. ***George S. Benton and Arthur B. Kahn.*** *Journal of Meteorology,* v. 15, no. 4, Aug. 1958, p. 404-410.

1650* Linear Waterflood Behavior and End Effects in Water-Wet Porous Media. Provides a more comprehensive picture of waterflood behavior in water-wet media and corroborates the validity of the scaling and stabilization concepts. ***J. R. Kyt and L. A. Rapoport.*** *Journal of Petroleum Technology,* v. 10, Oct. 1958, p. 47-50.

1651* Comparing the Rotary With Potential Drilling Methods. Most new methods of oil well drilling achieve increased rates of penetration essentially by increasing the mechanical power input to the rock over the maximum practical power level obtainable by conventional rotary drilling. However, whether this would decrease the drilling cost per foot of hole depends upon other factors as well, such as the cost of operation per unit time, well depth and the distribution of rocks of various drillabilities at the well site. ***R. Simon.*** *Journal of Petroleum Technology,* v. 10, Nov. 1958, p. 28-30.

1652* The Composition of Stars and Their Ages. Discusses methods of photoelectric narrow-band photometry and their application to problems concerning the composition of stars and their ages. ***Bengt Strömgren.*** *Observatory,* v. 78, Aug. 1958, p. 137-148.

1653* On the Reality of Expanding Motions in the Lacerta Aggregate. ***R. v. d. R. Woolley and Olin J. Eggen.*** *Observatory,* v. 78, Aug. 1958, p. 149-155.

1654* The Magellanic Clouds—Spectroscopy and Photometry of Bright Stars. Deals with three problems which can be profitably discussed on the basis of available material. ***M. W. Feast, A. D. Thackeray and A. J. Wesselink.*** *Observatory,* v. 78, Aug. 1958, p. 156-165.

1655 Near Infrared Solar Radiation Measurements by Balloon to an Altitude of 100,000 Feet. The first recordings of the near infrared solar spectrum from high altitudes were made by an infrared spectrograph carried to an altitude of 102,000 feet by a skyhook plastic balloon on June 22, 1955, between 0539 and 0830 MST. The total absorption in the 1.9-micron water vapor absorption band and in the 2.0-micron carbon dioxide absorption bands was measured as a function of altitude. The amount of absorbing constituent above each level was determined. ***David M. Gates, David G. Murcray, Clyde C. Shaw, and Robert J. Herbold.*** *Optical Society of America, Journal,* v. 48, Dec. 1958, p. 1010-1016.

1656 The Atlantic Lectures of the University of Texas. I. Offshore's Challenge to the Engineer. Area could prove to be the engineer's Utopia. ***J. B. Harrison and L. K. Williams.*** *Petroleum Engineer,* v. 30, Nov. 1958, p. B21-B25.

1657 Combatting Intermediate Quantities of Water in Air/Gas Drilling. Laboratory and field tests prove effectiveness of new foaming agent, permitting air and gas drilling with water influx up to 60 bbl. per hr. ***B. V. Randall, J. L. Lummus, and R. P. Vincent.*** *Petroleum Engineer,* v. 30, Nov. 1958, p. B26-B29.

1658* On a Method of Investigation of Fractured Rocks and Their Reservoir Properties. The objects of investigation are macro-fractures, the study of which is carried out mainly in outcrop, and micro-fractures, studied mainly in cores. ***E. M. Smekhov, et al.*** *Petroleum Geology,* v. 2, no. 3-B, 1958, p. 261-270.

1659* The Influence of Permeability of a Bed on the Position of the Water-Oil Contact. ***Iu. P. Gattenberger.*** *Petroleum Geology*, v. 2, no. 3-B, 1958, p. 281-285.

1660* A Fast Method of Calculation of the True Thickness of Beds According to the Apparent Thickness, Measured Along the Shaft of a Slanting Well. ***L. A. Buriakovskii.*** *Petroleum Geology*, v. 2, no. 3-B, 1958, p. 300-303.

1661 Convection Free Instrument for Measuring Infrared Radiation in the Atmosphere. The instrument described is a null type device which measures the equivalent black-body radiation temperature in the atmosphere at night by supplying electrical power to the absorber surface to replace the net loss of energy by radiation and keep the surface at the ambient air temperature. Thus convection effects are eliminated. ***Roger L. Aagard.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 1011-1016.

1662* The Soil Profiles and Geological Series Collection of the Institute of Applied Geology - The University of Florence. The collection of soil and lithological profiles taken with the methods described in this magazine during 1954 is illustrated. (*In Italian.*) La collezione di profili pedologici e serie geologiche dell'istituto di geologia applicata di firenze. ***Fiorenzo Mancini.*** *Ricerca Scientifica*, v. 28, July 1958, p. 1356-1364.

1663 Some Possible Evidence of Evolution in Individual Stars. ***Otto Struve.*** *Sky and Telescope*, v. 18, no. 2, Dec. 1958, p. 74 + 3 pages.

1664 Observations on Heavy Primary Cosmic Ray Nuclei Above the Atmosphere. Based on the interactions of L- and S-nuclei and their mean free paths in emulsion, the L°/M° ratio is estimated to be 0.26 ± 0.09 which favors a smaller flux of Li-Be-B nuclei at the top of the atmosphere than in most extrapolations of balloon observations. ***Herman Yagoda.*** *U. S. Air Force, Cambridge Research Center, Geophysical Research Papers No.* 60, July 1958, 33 pp. (QC806 Un3.2g Vis.)

1665 Project Vanguard Report No. 32, Minitrack Report No. 5, Minitrack Data for the Artificial Earth Satellites, 1958 Alpha and 1958 Beta. ***W. M. Hocking, Compiler.*** *U. S. Office of Naval Research. NRL Report* 5198, Sept. 22, 1958, 45 pp. (T21 Un3.5n Contin.)

See also: **1191** (radio astronomy); **2297** (ventilation of mines).

GRAPHIC ARTS

1666* Xerography Used to Advantage in England. At the Oxford and Cambridge Schools, Examination Board work has recently been streamlined by utilizing xerography and by switching more and more tasks to office offset-litho machines. *Offset Duplicator Review*, v. 8, no. 11, Nov. 1958, p. 10 + 2 pages.

1667 On the Information-Detecting Capacity of Photographic Emulsions. The concepts of quantum efficiency and detecting capacity of photographic emulsions are discussed with reference to the granularity, spread function, and characteristic curve of the emulsion. A measure of informational sensitivity is introduced which depends on these quantities and provides an objective measure of performance of emulsions when they are compared at their optimum working scales. ***H. J. Zweig, G. C. Higgins, and D. L. MacAdam.*** *Optical Society of America, Journal*, v. 48, Dec. 1958, p. 926-933.

1668 On the Point and Line Spread Functions of Photographic Images. Describes the three basic functions used to describe the image forming properties of photographic materials. The functions are the line spread function, the point spread function, and the transfer function (spatial frequency response). Only one of the three functions is independent, and therefore three pairs of conjugate relations exist among them. All six relations are given explicitly. ***R. Clark Jones.*** *Optical Society of America, Journal*, v. 48, Dec. 1958, p. 934-937.

1669 Spatial Frequency Response of Certain Photographic Emulsions. It is shown that certain common emulsion-developer systems can be satisfactorily treated by linear methods; an example is also given of a system where such methods are inadequate. A simple model is introduced to aid in specifying the frequency response and transient or "edge" response of the photographic systems tested. Damping constants based upon this model are tabulated for several emulsion-developer combinations and limitations of the model are discussed. ***James A. Eyer.*** *Optical Society of America, Journal*, v. 48, Dec. 1958, p. 938-944.

1670 Graininess and Entropy. A simplified model of grain is presented. Using a black and white checkerboard pattern of varying macroscopic transmission, the entropy, as defined in information theory, is computed and plotted as a function of transmission and density. The similarity between the entropy versus density curve and empirically determined graininess versus density curves suggest the possibility that the subjective term "graininess" represents the observer's description of the disorder of the granular sample. ***Edward L. O'Neill.*** *Optical Society of America, Journal*, v. 48, Dec. 1958, p. 945-947.

1671 Energy Transfers Between Crystals and Adsorbed Dyes. II. Effect of Concentration on Efficiency of Sensitization. The effect of density of sensitizer molecules adsorbed on a cadmium sulfide surface on the efficiency of sensitization by them has been studied for malachite green, pinacyanole, erythrosin, and 3,3' diethylthiacarbocyanine. The losses in the case of the first two are drastic and can be accounted for directly in terms of the properties of the solid dyes. ***R. C. Nelson.*** *Optical Society of America, Journal*, v. 48, Dec. 1958, p. 948-952.

1672* A Revision of the Relation Between American Standard Exposure Index and DIN Speed Resulting From a Recent Revision of the German DIN 4512 Standard. A table is given listing corresponding values of American Standard Exposure Index and DIN speed. ***J. L. Simonds.*** *Photographic Science and Engineering*, v. 2, no. 3, Oct. 1958, p. 162-163.

1673 Reproduction of Colour. Reviews the history and current methods of reproducing color with particular reference to photography, television, and printing. ***R. W. G. Hunt.*** *Research*, v. 11, Nov. 1958, p. 432-438.

1674 A New Approach to the Calibration of Photographic Equipment and Materials. The origin and meaning of conventional calibrations on photographic equipment and materials are discussed. A new system of calibrations, based on logarithms of the pertinent quantities, is described, and the advantages of this system in simplifying camera operation and exposure determination are discussed. ***Jan A. Van Den Broek.*** *Sylvania Technologist*, v. 11, no. 4, Oct. 1958, p. 132-139.

See also: **1429** (solubility of Ag halide emulsion crystals); **1727** (high-speed multiple-spark light sources).

HEAT POWER

1675 Analysis of the Steam-Turbine Reheat Cycle. An approach using successive approximations. ***J. Kenneth Salisbury.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1629-1642.

1676 The Boundary Layer on the End Wall of a Turbine Nozzle Cascade. Boundary layer flow was experimentally studied on an end wall of a turbine-nozzle cascade. The boundary layer was laminar at the throat of the nozzle, even when the upstream boundary layer was apparently turbulent. The end-wall boundary layer in the nozzle was little affected by the upstream boundary layer. A theoretical consideration supports the results and also reveals that the part of secondary flow in the nozzle, which is related to the upstream boundary layer, depends upon the configuration of the nozzle. ***Yasutoshi Senoo.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1711-1720.

1677 The Performance and Reliability of Aero-Gas-Turbine Combustion Chambers. A study of the range of running

conditions with special reference to the factors calculated to affect the life and reliability of the chamber. ***J. S. Clarke and H. E. Lardge.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1741-1755.

1678 The Use of Adjustable-Stator Blades to Reduce the Idle Fuel Flow of a Simple-Cycle, Single-Shaft Gas Turbine. A simple-cycle, single-shaft, gas turbine power plant was tested with adjustable compressor-stator blading to investigate this method of reducing idle fuel flow. Discusses the factors affecting idle fuel flow, and presents results of power-plant tests with several stator geometries. ***C. Howard, Jr. and R. L. Hendrickson.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1773-1778.

1679 Present State and Future Outlook of the Free-Piston Engine. Gives a short description of the type GS-34 gasifier, with diagrams showing the main operational factors versus gas pressure and stroke length. The present state of its application to ships, stationary plants, and locomotives is reviewed briefly. The trend of future development is examined, especially with regard to an increase in power output per gasifier. ***R. Huber.*** *ASME, Transactions*, v. 80, no 8, Nov. 1958, p. 1779-1790.

1680 Optimization of Plate-Type Air Preheaters for Automotive Gas Turbines. Deals with recuperative plate-type heat-exchanger elements for a composite air preheater for automotive gas turbines. The general requirements and optimization of the essential dimensions of such an element are discussed. ***W. Hryniszak.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1791-1801.

1681 Dynamic Analysis of a Boiler. Analysis is accomplished by certain approximations which reduce the nonlinear partial differential equations to linear ordinary time-differential forms, and make it possible to obtain the time-dependent functions of large numbers of boiler variables. ***K. L. Chien, E. I. Ergin, C. Ling, and Allyn Lee.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1809-1819.

1682 Rocket Propulsion Requirements for Satellites and Moon Missions. Velocity requirements for several missions are given. Propulsion by various rocket methods are described briefly with more detail on high-energy chemical rockets. ***John L. Sloop.*** *Aero/Space Engineering*, v. 17, Nov. 1958, p. 36 + 9 pages.

1683 Air-Breathing Power Plants in the Space Era. Study indicates that the air-breathing power plant has not yet attained its optimum development and has not yet realized its maximum versatility as a power plant for civilian and military use. Shows that the air-breathing engine complements the rocket rather than competes with it. ***Peter G. Kappus.*** *Aero/Space Engineering*, v. 17, Nov. 1958, p. 62 + 4 pages.

1684* Experiences With Two 1110° F High Pressure Power Plants of the Feldmühle Papier- und Zellstoffwerke AG. Details on destruction of austenitic/ferritic flange connections and of gauze plate filters. Turbine damage through oil-coke, foreign matter on and damage of runner blades are described. (*In German.*) Erfahrungen in zwei 600° C-Hochdruck-Kraftwerken der Feldmühle Papier- und Zellstoffwerke AG. ***F. Wehrberger.*** *Brennstoff-Wärme-Kraft*, v. 10, Oct. 1958, p. 466 + 8 pages.

1685 High Energy Fuels for Jet Propulsion Engines. The basic power and thrust equations are presented, showing that high heat of combustion is the most significant fuel property for air breathing engines, but other properties including molecular weight of the products of combustion and temperature of combustion become equally significant for the rockets. ***C. W. Perry.*** *Canadian Journal of Chemical Engineering*, v. 36, no. 6, Dec. 1958, p. 247-251.

1686* Enterprise RV-16 Dual-Fuel Engine for Municipal Power. First installation in the United States of the sixteen-cylinder Enterprise engine. *Gas and Oil Power*, v. 53, Oct. 1958, p. 264-266.

1687 The Transonic Flow Field of an Axial Compressor Blade Row. The general three-dimensional theory for compressible flow through axial compressor blade rows is applied to transonic cases. Because of the occurrence in the transonic range of acoustic resonance, the theory is modified to include first-order viscous and heat-conduction effects. Numerical examples of the behavior of a transonic blade row are represented and discussed. ***James E. McCune.*** *Journal of the Aero/Space Sciences*, v. 25, Oct. 1958, p. 616-626.

1688* Estimation of Annual Average Thermal Efficiency of Modern Steam Power Plants in a Large Hydro-Steam Combined Electric Power System. ***Taturo Okubo and Hiroshi Nishihara.*** *Kyoto University, Memoirs of the Faculty of Engineering*, v. 20, pt. 3, July 1958, p. 182-210.

1689* High-Altitude Engine Test Plant. At a cost of over five million pounds, Rolls-Royce, Ltd., have built—entirely as a private venture—a new high-altitude test plant which will allow engines to be tested in conditions simulating flight at up to 70,000 ft. altitude and more, and at speeds of up to Mach 2.5. *Overseas Engineer*, v. 32, Nov. 1958, p. 130-131.

1690* Automatic Washing Cuts Air Preheater Cleaning Problems. New water washing system reduces manpower requirements and need for extended low-load operation by cleaning horizontal air preheaters in off-peak hours while boiler is in service. ***W. C. Ames.*** *Power*, v. 102, Nov. 1958, p. 110-111.

1691 Review of High-Temperature Immersion Thermal Sensing Devices for In-Flight Engine Control. Performance and service requirements. The possibility of exploiting the pneumatic probe and the high-temperature thermocouple to these ends is explored. Summaries are presented reviewing the technical development of high-temperature measurement by these methods. ***Victor D. Sanders.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 917-928.

1692* Selecting the Right Turbocharger. For a high-speed diesel engine selection requires an analysis of the engine, ambient conditions, and the control system. ***Wilton E. Parker.*** *SAE Journal*, v. 66, Nov. 1958, p. 42-45.

1693 Effect of Fuel Variables on Carbon Formation in Turbojet-Engine Combustors. The effects of fuel properties and of a number of fuel additives on combustion-chamber carbon deposition and exhaust-gas smoke formation were investigated in a single tubular turbojet-engine combustor. ***Edmund R. Jonash, Jerrold D. Wear, and William P. Cook.*** *U. S. National Advisory Committee for Aeronautics, Report* 1352, 1958, 18 pp. (TL521 Un3r Vis.)

1694 Screaming Tendency of the Gaseous-Hydrogen-Liquid-Oxygen Propellant Combination. An exploratory study was made in 200-pound-thrust rocket engines. The results indicate that the gaseous-hydrogen - liquid-oxygen propellant combination may not have the marked screaming tendency of some all-liquid combinations. ***Louis Baker, Jr. and Fred W. Steffen.*** *U. S. National Advisory Committee for Aeronautics, Research Memorandum, RM-E58E09*, Sept. 30, 1958, 24 pp. (TL782 Un3rm Vis.)

1695 Combustor Performance With Various Hydrogen-Oxygen Injection Methods in a 200-Pound-Thrust Rocket Engine. Fourteen different injectors, which varied mixing and oxygen atomization, were evaluated. ***M. F. Heidmann and Louis Baker, Jr.*** *U. S. National Advisory Committee for Aeronautics, Research Memorandum, RM-E58E21*, Sept. 30, 1958, 45 pp. (TL782 Un3rm Vis.)

1696 An Analysis of Ramjet Engines Using Supersonic Combustion. Based on the assumption that shock-free internal burning is possible in a supersonic airstream, calculations are made for the performance of ramjets at such velocities. ***Richard J. Weber and John S. MacKay.*** *U. S. National Advisory Committe for Aeronautics, Technical Note* 4386, Sept. 1958, 49 pp. (TL570 Un3t Vis.)

See also: **1313** (treatment of boiler feedwater); **1738** (bearings for gas turbines).

INFORMATION—PREPARATION AND DISSEMINATION

1697* Bibliography of New Developments in the Ceramics Industry. Covers material from many sources published in all languages in all major countries from 1941 through 1957. Report No. 4338 v. I-II. 73 and 48 pp. J. J. Berliner & Staff, New York. (Z7179 B45b Ref.)

1698* Bibliography on New Developments in Concrete. Covers material from many sources published in all languages. in all major countries from 1944 through 1957. Report No. 4349. v. I-II. 88 and 52 pp. J. J. Berliner & Staff, New York. (Z5853.M4 B45b Ref.)

1699 Review of Iron and Steel Literature for 1957. III. ***Esther Chesire.*** *Blast Furnace and Steel Plant*, v. 46, Nov. 1958, p. 1192 + 4 pages.

1700 Information—A Growing Crisis. Documentation experts pinpoint status of data retrieval today; industry backs steroids data hunt. *Chemical and Engineering News*, v. 36, no. 47, Nov. 24, 1958, p. 21-23.

1701 Today, Accuracy Demands the First Person. Explains why use of the first person in technical writing is not a question of style, but rather one of accuracy. ***Ethaline Cortelyou.*** *Chemical Engineering*, v. 65, Nov. 3, 1958, p. 147-148.

1702 A Directory of Advertisers' Literature. A listing of 533 brochures and catalogs. *Consulting Engineer*, Nov. 1958, pt. 2, 44 pp.

1703* Locating Russian Materials on Food and Food Technology. Bibliographic resources and services are described. ***James G. Hodgson.*** *Food Technology*, v. 12, Nov. 1958, p. 634-635.

1704 How Much Science Can You Have at Your Fingertips? Numerous suggestions are presented for helping men to learn and retrieve scientific information, with or without artificial aids. Concludes with a warning that some of the world's greatest scientists have done their best work when they were given plenty of time to think their own thoughts. ***I. J. Good.*** *IBM Journal of Research and Development*, v. 2, no. 4, Oct. 1958, p. 282-288.

1705 Computers as Tools for Synthesis, Experimentation, and Information Handling. Computers are becoming more accessible and useful to us through new techniques of communication such as problem-oriented "languages", specialized coding systems, and an emerging data processing discipline. ***William Orchard-Hays.*** *Industrial and Engineering Chemisty*, v. 50, Nov. 1958, p. 1654-1656.

1706* Engineers and English—a Challenge. The graduate engineer, who after analyzing his failures find them attributable to his inability to communicate effectively, would do well to make a determined effort to gain the knowledge and habits which lead to communication perfection. ***P. A. Matthews.*** *Industrial Science and Engineering*, v. 5, no. 5, Oct. 1958, p. 13 + 1 page.

1707 The Low Temperature Liquid Phase Oxidation of Hydrocarbons: A Literature Survey. Lists and discusses 65 references. ***Frank Morton and R. T. T. Bell.*** *Institute of Petroleum, Journal*, v. 44, Sept. 1958, p. 260-272.

1708 The Chemical and Related Literature of Australia and New Zealand. Tables present a list of journals published in Australia and New Zealand by research institutions, learned societies, and universities. ***Leo J. Stevens.*** *Journal of Chemical Education*, v. 35, Nov. 1958, p. 566-567.

1709* The Divided Catalog: A Summary of the Literature. A number of opinions are summarized. ***Dorothy Grosser.*** *Library Resources and Technical Services*, v. 2, no. 4, Fall, 1958, p. 238-252.

1710* The Russian Exchange Program at Columbia University. ***Karol Maichel.*** *Library Resources and Technical Services*, v. 2, no. 4, Fall, 1958, p. 254-258.

1711* The Literature of Space Science and Exploration. Covers the period 1903 through June 1958 with 2274 entries together with author and subject indexes. ***Mildred Benton, compiler.*** 264 pp. Sept. 1958. U. S. Naval Research Laboratory, Washington, D. C. (ZTL790 B44L Ref.)

1712* Some Problems and Questions Concerning Patent Documentation in Industry. Different possibilities derived from the use of mechanical storage devices in patent documentation. Low cost and high informational capacity of magnetic band storage devices. Five proposals are given. (*In German.*) Einige Probleme und Fragen der Patentdokumentation im Industriebetrieb. ***H. F. Albrecht.*** *Nachrichten für Dokumentation*, v. 9, no. 3, Sept. 1958, p. 117-122.

1713* Actual Conditions of Technical Publications. A survey of the production of technical books in Poland during 1957. From 1955 to 1957 the number of titles fell from 796 to 535. The largest number of pages have been written about machine construction, transport, and communication. (*In Polish.*) Aktualny stan wydawnictw technicznych. ***Heliodor Chmielewski.*** *Przegląd Techniczny*, 1958, no. 18, Sept., p. 864-867.

1714 Teaching Machines. Requirements, programming, and use of machines for testing and teaching students. ***B. F. Skinner.*** *Science*, v. 128, Oct. 24, 1958, p. 969-977.

1715* United States Scientific and Technical Information Services. Discusses the present situation in the United States, the principal scientific and technical information activities now being carried on within the Federal Government, and a proposal which the National Science Foundation believes will go far toward remedying this country's scientific and technical information ills. ***Burton W. Adkinson.*** *Special Libraries*, v. 49, no. 9, Nov. 1958, p. 407-414.

1716* Documentation in the Field of Science. An analysis of the current dilemma and some relieving suggestions based on *Chemical Abstracts'* philosophy. ***Charles L. Bernier.*** *Special Libraries*, v. 49, no. 9, Nov. 1958, p. 415-420.

1717 Dynamic Needs for Information Reshape the Library Function. Application of the information specialist to the project team. ***E. L. D'Ouville and J. W. Mohlman.*** *Special Libraries*, v. 49, no. 9, Nov. 1958, p. 427-430.

See also: **1485** (technical information processing); **1487** (machine techniques for technical literature); **2138** (library personnel administration).

INSTRUMENTATION

1718 Design Factors in Thermostat Selection. Type of contact operation, temperature differential range, mode of heat sensing, form of enclosure and cost are among the elements to be considered by the thermostat user. ***Paul Dahlen.*** *Electrical Manufacturing*, v. 62, Nov. 1958, p. 140 + 5 pages.

1719* On the Magnetoelectric Oscillographs With Frame Type Galvanometers. New possibilities of measurements by using magnetoelectric multichannel oscillographs in a circuit with a frame type galvanometer. Development and applicability of these oscillographs; circuits for measuring vibrations and short-circuit currents. (*In Russian.*) O magnitoelektricheskikh ostsillografakh s ramochnymi gal'vanometrami. ***L. A. Biber and Iu. M. El'kind.*** *Elektrichestvo*, 1958, no. 10, Oct., p. 70-72.

1720 Soft X-Ray Spectroscopy Using an Electron Multiplier. The modification to a soft X-Ray spectrograph in order to use an electron multiplier instead of a photographic plate is described. The instrument has been calibrated with the aluminum and magnesium L_{23} spectra. ***J. A. Catterall, L. F. Wilson, and J. Trotter.*** *Journal of Scientific Instruments*, v. 35, Nov. 1958, p. 393-395.

1721 A Method of Maintaining Temperature Control Over a Wide Range. Thermal equilibrium is maintained by a stream of gas that is brought to the required temperature in a heat exchanger. The system is effective in the range −150 to 200 C,

and the temperature stability varies from about ± 1 C in the range 20 to 200 C to ± 5 C below −110 C. ***H. L. Allsopp and D. F. Gibbs.*** *Journal of Scientific Instruments*, v. 35, Nov. 1958, p. 395-397.

1722 A Differential Thermal Analysis Apparatus. An automatic differential thermal analysis apparatus of high sensitivity is described in detail. The rate of heating is servo-controlled to give any selected value from 6 to 20 C per minute. Curves are obtained directly on an *X-Y* potentiometric recorder. Temperature differences can be detected to within 0.1 C. Reference is made to the application of the apparatus in the study of glass-making reactions. ***F. W. Wilburn.*** *Journal of Scientific Instruments*, v. 35, Nov. 1958, p. 403-407.

1723 The Effect of Variations in Ambient Temperature Upon the Optical Alinement of an X-Ray Fluorescence Spectrometer. During proving tests made on an X-ray fluorescence spectrometer, it was found that variations in ambient temperature produced a significant effect upon the dispersion of the instrument. Experimental evidence indicated that this was due to changes in the interplanar spacing of the diffracting crystal. The magnitude of the effect is shown to be in good agreement with theoretical considerations. ***T. A. Davies.*** *Journal of Scientific Instruments*, v. 35, Nov. 1958, p. 407-409.

1724 A Two Co-Ordinate Light Pointer and Its Application to a Recording Interferometer. A light pointer is described which allows the deflections of two mirrors to be recorded in a two co-ordinate graph. This is used in a direct-recording Fabry-Perot interferometer for displaying the intensity as a function of air pressure. ***H. G. Kuhn and H. J. Lucas-Tooth.*** *Journal of Scientific Instruments*, v. 35, Nov. 1958, p. 413-415.

1725 A Rotational Viscometer Employing a Reference Liquid. The ratio of the rates of rotation of the driven and free rotors is a linear function of the viscosity being measured, and, apart from a negligible effect of bearing friction, is independent of the absolute rotational speed of the driven rotor when using Newtonian liquids. ***J. F. Hills.*** *Journal of Scientific Instruments*, v. 35, Nov. 1958, p. 415-418.

1726* Design Problems With Standard Type Pneumatic Controllers. Standard type pneumatic controllers with PI-action have been chosen as example to demonstrate the difficulties encountered in designing the principal units, as e.g. differential pressurestats and interconnections, both for way and force comparing types. (*In German.*) Konstruktionsprobleme an pneumatischen Einheitsreglern. ***G. Klee.*** *Regelungstechnik*, v. 6, no. 10, 1958, p. 367-371.

1727 High-Speed Multiple-Spark Light Source. A source is described which can be used in the photographic systems of shock tunnels, shock tubes, and ballistic ranges. The source provides five high-intensity flashes, each with available delays of as low as 0.1 μ sec between consecutive sparks. The assemblies are mounted in line with a lens system to provide a common point where all spark flashes are brought to focus. ***Merle R. Wilson and Richard J. Hiemenz.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 949-951.

1728 Two-Component Capacitance-Type Displacement Detector. The design, construction, and operation are described. In the operation of the detector the frequency shifts of two oscillators are observed; these frequencies depend on the separation distance of two probe capacitor plates from a third ground plate that is common to both of them. ***John A. Rider and W. L. Roever.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 951-961.

1729 Microscope Mechanical Object Stage for the Study of the Tracks of Charged Particles in Photographic Emulsions or Other Objects in Transparent Media. In addition to the usual arrangements for measurements of the x and y co-ordinates for nuclear tracks in photographic emulsions, the stage is rotatable about the optical axis of the microscope as well as about an axis perpendicular to the optical axis. The angles of rotation can be read off scales. ***Hilding Slätis.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 968-970.

1730 Microcomparator Illumination System for Improved Resolution of Rayleigh Diffusiometer Diagrams. System permits Rayleigh diffusiometer diagrams to be measured with increased precision. Measurement is based on the use of diffraction patterns generated by the Rayleigh diagram when this diagram is illuminated with point source, divergent, monochromatic light. ***J. L. Oncley, M. Ludwig, and T. E. Thompson.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 985-987.

1731 Gas Circulating Apparatus Containing a Magnetic Balance. A gas circulating system is described in which a sample undergoing thermal decomposition can be weighed continuously by means of a magnetic balance having a sensitivity of the order of 0.1 mg. Changes of composition in the gases contained in the system are determined by withdrawing samples directly into a mass spectrometer for analysis. ***L. C. Scala, W. M. Hickman, and A. Langer.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 988-990.

1732 A Micro Sample Introduction System for Gas Chromatography. To take advantage of increased sensitivity of detection in gas chromatography without the necessity for dilution and contamination of liquid samples with relatively large quantities of carrier liquid, an apparatus permitting the reproducible injection of known volumes in the μgm.-range was designed. ***Robert L. Bowman and Arthur Karmen.*** *Nature*, v. 182, Nov. 1, 1958, p. 1233-1234.

1733 Photoelectric Color Difference Meter. Meter has three photodetectors, each with a separate tristimulus filter, and each receiving some of the light reflected from the specimen. Signals from the photodetectors are measured by analog circuits that give rectangular coordinates for surface colors in close correspondence to their positions in uniform color space. ***Richard S. Hunter.*** *Optical Society of America, Journal*, v. 48, Dec. 1958, p. 985-995.

1734 A Cooled-Gas Pyrometer for Use in High-Temperature Gas Streams. A technique is described whereby calibration constants obtained in air at near room total temperature are used to compute the high-temperature correlations for other gases with known property values. ***Lloyd N. Krause, Robert C. Johnson, and George E. Glawe.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4383, Sept. 1958, 32 pp. (TL570 Un3t Vis.)

1735* The Titanium Pump: A Device for the Maintenance of Vacuum in Electronic Tubes. ***H. Huber and Monique Warnecke.*** *Vide*, v. 13, Mar.-Apr. 1958, p. 84-90.

1736* Determination of the Specific Surface Areas of Porous Bodies and of Powders by the Method of Gaseous Flow Under Low Pressure. A new method for the quick determination of the specific surface area of porous bodies and powders based on measuring the time of pressure equilibration on both sides of a porous membrane. With the aid of the method, the specific surface areas of a number of porous bodies have been measured. (*In Russian.*) Izmerenie udel'noi poverkhnosti poristykh tel i poroshkov metodom istecheniia razrezhennoga gaza. ***S. G. Entelis, M. A. Tsikulin, L. V. Volkov, and N. M. Chirkov.*** *Zhurnal Fizicheskoi Khimii*, v. 32, no. 9, Sept. 1958, p. 2187-2191.

See also: **1277** (high-temperature recording dilatometer).

LUBRICATION AND FRICTION

1737 A Theory of Lubrication in Short Journal Bearings With Turbulent Flow. Expressions for the pressure distribution, the load capacity, and the attitude angle were obtained. Also, the condition of laminar flow is shown as the special case of this study. ***L. N. Tao.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1734-1740.

1738 Slipper Bearings and Vibration Control in Small Gas Turbines. Several new principles of bearing design proved

effective in improving the reliability and smoothness of small gas turbines. The key development is the tilting-slipper thrust bearing which not only provided important radial clearance, but also made possible higher speeds at higher thrust loads. One of the unique features considered important for performance and low production costs is that the slippers float in their retainers instead of having fixed pivots. ***H. C. Hill.*** *ASME, Transactions,* v. 80, no. 8, Nov. 1958, p. 1756-1764.

1739 The Rectangular Plane Pad Bearing. A theoretical treatment of a bearing of infinite and finite width. ***Bengt Jakobsson and Leif Floberg.*** *Chalmers Tekniska Högskolas Handlingar,* no. 203, 1958, 43 pp. (T4 C35t Contin.)

1740 Static Friction in Dynamic Systems. The explanation of some self-excited vibrations requires the force to decrease with the velocity, retaining the opposite sign, however. Such definitions are sufficient for predicting the effect on single-degree-of-freedom systems, except for the time history. ***Carl F. Branson.*** *Journal of the Aero/Space Sciences,* v. 25, Oct. 1958, p. 654-655.

1741* Chemical Conversion Coatings for the Lubrication of Titanium. Titanium and its alloys have a severe tendency to seize and gall when in moving contact with themselves or other metals. Lubrication of the bare metal has been successful only to a limited extent. Galling can be greatly reduced by using chemical conversion coatings with lubricants. Both anodic coatings and simple dip coatings hold lubricants effectively and eliminate or reduce galling in wear applications. The results of wear testing, wire drawing, and cold forming of sheet using conversion coatings are discussed. A satisfactory coating can be formed by anodizing in a 5% solution of NaOH. A fluoride-phosphate conversion coating can be formed by simple immersions in a solution containing HF, KH, and Na_3PO_4. ***E. L. White and P. D. Miller.*** *Lubrication Engineering,* v. 14, no. 11, Nov. 1958, p. 479-482.

1742 New Techniques Revealed at West Coast Lubrication Conference. Radioactive tracers, interference microscopy, and high-speed computers are making strong headway in bearing and lubrication research. Sixteen of the 26 papers presented at the ASLE/ASME Lubrication Conference in Los Angeles, Oct. 13-15, are reviewed here by a well-known specialist from MIT. ***Ernest Rabinowicz.*** *Product Engineering,* v. 29, no. 46, Nov. 10, 1958, p. 84-85.

1743 Lubrication in the Nuclear Age. Lubrication of reactor components. Effects of radiation on lubricants. ***C. G. Williams.*** *Scientific Lubrication,* v. 10, Nov. 1958, p. 13-16.

1744 The Wear of Metals. General explanation of wear phenomena. Use of radioactive tracers. Relations between wear rate and load. ***J. F. Archard.*** *Scientific Lubrication,* v. 10, Nov. 1958, p. 16-21.

1745* Methacrylate Polymers as Oil Additives. Oil-soluble methacrylate polymers were first produced commercially by Rohm and Haas, Philadelphia, during World War II and were used as viscosity index improvers for hydraulic fluids. These polymers permitted the formulation of a single fluid which would serve over the entire range of temperatures encountered in the field operation of military aircraft. ***C. J. Prizer.*** *Petroleum,* v. 21, Nov. 1958, p. 395-398.

1746* Air-Lubricated Bearings for High-Speed Motors and Turbines. Description of a high-speed motor with air-lubricated bearings successfully tested in laboratory and industrial conditions, in the latter as an internal grinding head. The head assures high-quality grinding and high efficiency. Design and manufacturing details. (*In Russian.*) Aerodinamicheskie opory dlia vysokoskorostnykh dvigatelei i turbin. ***S. A. Sheinberg and A. M. Kharitonov.*** *Vestnik Mashinostroeniia,* v. 38, no. 9, Sept. 1958, p. 14-17.

See also: **1402** (synthetic lubricants); **1599** (wear of plant equipment); **1759** (rubber auto springs); **1857** (babbitting bearings); **2273** (automotive tire abrasion at different temperatures).

MECHANICAL ENGINEERING

1747 Vibration and Shock in Freight Cars as Causes of Lading Damage. Vibration and shock are two probable causes of lading damage. These two problems are analyzed briefly and on the basis of the findings methods are suggested for improving equipment design to reduce damage to both lading and equipment due to these two causes. ***James C. Settles.*** *ASME, Transactions,* v. 80, no. 8, Nov. 1958, p. 1622-1628.

1748 Application of the Griffith-Irwin Theory of Crack Propagation to the Bursting Behavior of Disks, Including Analytical and Experimental Studies. Presents the results of bursting tests of large, bored, and effectively notched disks removed from long rotor forgings. Most of the tests were conducted at room temperature. For the particular disk geometry employed, the net average tangential stress at bursting speed was as low as 25,000 psi for brittle-behaving materials and as high as 77,000 psi for materials approaching ductile behavior. ***D. H. Winne and B. M. Wundt.*** *ASME, Transactions,* v. 80, no. 8, Nov. 1958, p. 1643-1658.

1749 An Indirect Method for Determining Accelerations in Complex Mechanisms. In complex mechanisms such as the six-bar, two-pivot linkage the graphical construction for determining accelerations can be simplified by starting from a point on the mechanism other than the point whose acceleration is known. Arbitrary values of velocity and acceleration can be assumed for the starting point, and the accelerations of other points can be obtained graphically on the basis of this arbitrary assumption. The accelerations so found can be converted into the actual accelerations in the mechanism by means of a simple formula. ***Thomas P. Goodman.*** *ASME, Transactions,* v. 80, no. 8, Nov. 1958, p. 1676-1682.

1750 Three-Dimensional Photoelasticity and Its Application in Machine Design. The simplest equipment, the best model materials, and the most effective techniques for three-dimensional photoelastic tests are described. The optical equipment involves only a simple diffusion polariscope using only a single camera lens. Methods of applying the photoelastic results in practical design applications where fatigue, repeated strain cycling, plastic flow, and creep-rupture effects may occur during operation. ***M. M. Leven and A. M. Wahl.*** *ASME, Transactions,* v. 80, no. 8, Nov. 1958, p. 1683-1694.

1751 Dynamic Characteristics of Cam Forms Calculated by the Digital Computer. Presents a simple, numerical method for analyzing the residual vibrational-stress characteristics of any cam form for which the cam-acceleration function is known. ***S. Mercer, Jr. and A. R. Holowenko.*** *ASME, Transactions,* v. 80, no. 8, Nov. 1958, p. 1695-1705.

1752 On the Art of Designing Compressor Foundations. The designer of foundations for vibrating machines, such as compressors, must consider several related fields. The behavior of soil under static and vibrational loads and the magnitude and effects of soil distortions must be evaluated. Means of limiting vibration and the possibilities of deterioration or distortion of the actual foundation must be considered. This paper summarizes the relationship of present thinking and recent studies in the various fields to compressor foundations. ***W. F. Swiger.*** *ASME, Transactions,* v. 80, no. 8, Nov. 1958, p. 1706-1710.

1753* Flexural Vibrations of a Thin-Walled Cylinder of Rectangular Cross Section. Explicit stress-function solutions are obtained for the webs and the top and bottom surfaces so that the effects of shear lag and shear deflections are inherently included. The results are expressed simply in terms of an effective flexural rigidity, which may be determined with the aid of a number of graphs. ***E. H. Mansfield.*** *Aeronautical Quarterly,* v. 9, pt. 4, Nov. 1958, p. 331-345.

1754* A Rapid Method for Calculating the "Off-Design" Performance of Compressors and Turbines. Over-all performance of a machine may be obtained in an integral form which permits a rapid calculation of performance maps for rotational speeds and flow rates not greatly different from design values. The method may be of use in preliminary design studies of multi-stage compressors and turbines. ***J. H. Horlock.*** *Aeronautical Quarterly,* v. 9, pt. 4, Nov. 1958, p. 346-360.

1755* Matrix Analysis of Shell Structures With Flexible Frames. A simple matrix method is presented for the deflection and stress analysis of cylindrical shell structures of arbitrary cross section stiffened by flexible frames. ***J. S. Przemieniecki.*** *Aeronautical Quarterly*, v. 9, pt. 4, Nov. 1958, p. 361-394.

1756* Local Stresses Appearing on Bending a Round Prismatic Rod With an Elliptic Non-Coaxial Hole. Mathematical analysis. (*In Russian.*) Mestyne napriazheniia pri izgibe kruglogo prizmaticheskogo brusa s ellipticheskim nesoosnym otverstiem. ***Iu. A. Amenzade.*** *Akademiia Nauk SSSR, Doklady*, v. 122, no. 3, Sept. 21, 1958, p. 356-359.

1757 Column-Beams and Suspension Bridges Analyzed by "Green's Matrix". Use of a symmetric system of band equations of the second order. The matrix of the system is inverted by a method similar to that used in establishing Green's functions. ***Sven Olof Asplund.*** *Chalmers Tekniska Högskolas Handlingar*, no. 204, 1958, 36 pp. (T4 C35t Contin.)

1758 Automatic Minimum Weight Design of Steel Frames. The automatic plastic design of structural frames can be treated by the method of linear programming. The number of variables, however, increases so fast with the complexity of the frame that only simple frames can be handled by this method even on a large electronic computer. A method is proposed which considers alternately two different requirements that a frame must satisfy, and thereby greatly reduces the size of the problem. ***Jacques Heyman and William Prager.*** *Franklin Institute, Journal*, v. 266, no. 5, Nov. 1958, p. 339-364.

1759* Rubber Springs for Vehicle Suspension. A research program of both field and laboratory testing has been carried out to confirm the suitability of rubber for suspension purposes, and to develop some modern forms of rubber springs. Laboratory work included, in addition to the fatigue testing of a wide diversity of spring types, the development of a method of strain measurement for springs of irregular shape, and the determination of a basic parameter of fatigue applicable to any type of rubber spring. Service testing included the investigation of endurance characteristics, optimum values for the static deflection, damping and low temperature properties, permanent set and noise isolation. ***A. E. Moulton and P. W. Turner.*** *Institution of Mechanical Engineers, Automobile Division, Proceedings*, 1956-1957, no. 1, p. 17-42 + 7 plates.

1760* A Review of Hydrokinetic Fluid Drives and Their Possibilities for the British Motor Industry. The history of the development of hydrokinetic fluid transmissions is traced from its origin by Föttinger to the present time, and the important early developments and types of devices are recorded. Consideration is given to special design features and current practice for the use of these devices in transmissions for motor vehicles, and the theoretical basis of design is reviewed briefly. ***J. G. Giles.*** *Institution of Mechanical Engineers, Automobile Division, Proceedings*, 1956-1957, no. 2, 92 pp.

1761* Transmission Developments for Public Service and Heavy Goods Vehicles. Reviews the use, development, and history of the transmission system as applied to commercial vehicles and forecasts the future trends. The characteristics of the various systems at present available are examined from the aspect of their effect on vehicle performance. ***A. Gordon Wilson.*** *Institution of Mechanical Engineers, Automobile Division, Proceedings*, 1956-1957, no. 3, p. 93-130.

1762 Thermal Stress in Curved Beams. Thermoelastic stresses are investigated in curved beams of constant properties and constant cross section under temperatures varying in the radial direction only. Good agreement is found between stresses as calculated from elasticity theory and from strength-of-materials theory which assumes that plane sections remain plane. A comparison with the corresponding strength-beam formula is also included. ***Bruno A. Boley and Eural S. Barrekette.*** *Journal of the Aero/Space Sciences*, v. 25, Oct. 1958, p. 627 + 4 pages.

1763 Friction-Clutch Transmissions. I. Factors in Clutch Performance. Analyzes the performance of friction clutches and systems, with particular attention to the problem of vibration. ***Z. J. Janiu.*** *Machine Design*, v. 30, Nov. 13, 1958, p. 132-136.

1764* Fine Pitch Gears. I. Designing the Blank. Gear design and fabrication techniques. ***Harry A. Devine.*** *Machine and Tool Blue Book*, v. 53, Oct. 1958, p. 99-103.

1765 How to Use Influence Factors to Calculate Shaft Misalignment Moments. In misaligned shaft assemblies of two spans, stress-causing moments are easy to calculate by the influence-factor method. However, for shafts of more than two spans, analysis becomes more complex. In this article the influence factor is employed to develop the moment equations for a three-span, nonuniform shaft system. Procedures developed can be used for systems with any number of spans. ***Augustine J. Scalzo.*** *Machine Design*, v. 30, Nov. 13, 1958, p. 157-160.

1766 The Philips Pavilion at the 1958 Brussels World Fair. II. The Hyperbolic-Paraboloidal Shell and Its Mechanical Properties. The geometry of the hypar shell; the membrane theory of the hypar shell; edge disturbances; stability against buckling and second order buckling. ***C. G. J. Vreedenburgh.*** *Philips Technical Review*, v. 20, no. 1, Sept. 1958, p. 9-17.

1767 Your Guide to Springs That Store Energy Best. How well a spring can absorb energy depends on its shape and material. Some springs, such as glass-reinforced plastic bars do surprisingly well—better than the workhorses like helicals and cantilevers. Here are equations and two tables that give definite comparisons between types. ***Karl W. Maier.*** *Product Engineering*, v. 29, no. 46, Nov. 10, 1958, p. 71-76.

1768 The Design Twist That Gives Better Non-Clogging Centrifugal Pumps. A special impeller is needed when a centrifugal pump has to handle pulpy liquids. Here's how new designs from Sweden compare with other special types that won't get fouled up. ***T. Ygge.*** *Product Engineering*, v. 29, no. 46, Nov. 10, 1958, p. 78-79.

1769 Mechanical Alternator Drive Saves Weight and Fuel. The properties of new high performance aircraft have caused mechanical designers to take a new look at the possibilities in metal-to-metal drives. ***John McGraw.*** *Space/Aeronautics*, v. 30, no. 5, Nov. 1958, p. 44-48.

1770 Stress Resultants and Out-of-Plane Deformations in Stiff Rings Attached to Elastic Cylinders and Subject to Concentrated Loads. Expressions are derived which give the internal loads and deformations of a relatively stiff ring which is mounted on an elastic cylinder. Three basic types of loads acting on the ring are considered: a concentrated force acting in the direction parallel to the axis of the cylinder, a bending moment acting about a radial axis, and a bending moment acting about a tangential axis. ***Bernard W. Shaffer and Eric E. Unger.*** *U. S. Atomic Energy Commission, APEX*-401, Aug. 1958, 51 pp. (UF767 Un3.1ap Contin.)

1771 Tests of Ring-Stiffened Circular Cylinders Subjected to a Transverse Shear Load. Thirty-four circular cylinders stiffened by heavy rings were loaded to failure in combined bending and shear with a transverse shear load. The results are presented in the form of an interaction curve which is applicable to the design of ring-stiffened cylinders that fail as a result of local buckling. ***James P. Peterson and Richard G. Updegraff.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4403, Sept. 1958, 12 pp. (TL570 Un3t Vis.)

1772* Residual Stresses and Strength of Case-Hardened Gear Teeth. Study of the influence of residual stresses on fatigue strength of a tooth in connection with a defect of the tooth called "pole fracture" and occurring in case-hardened gears with teeth ground after hardening. (*In Russian.*) Ostatochnye napriazheniia i prochnost' zub'ev tsementirovannykh shesteren. ***D. S. Elenevskiĭ.*** *Vestnik Mashinostroeniia*, v. 38, no. 9, Sept. 1958, p. 10-13.

See also: **1297** (strength of hollow concrete block walls); **1311** (thermal stress in bodies of revolution); **1745** additives for hydraulic fluids); **1874** (impact tests on welded Al railroad cars); **2237** (plastic pressure vessels).

METALLURGY

1773* Low-Carbon Manganese-Chromium-Molybdenum-Vanadium Steel for Pressure Vessels. Developed to provide the desired combination of properties at the minimum cost. ***I. M. Mackenzie.*** *Alloy Metals Review*, v. 9, no. 89, Sept. 1958, p. 2-8.

1774* An Apparatus for the Determination of the Gas Content of Aluminum Alloys During Melting and Casting. The instrument responds very rapidly, reaching its final deflection in 1½-3 minutes, depending on the gas content. With a relatively small scatter in the measured values good accuracy is attained. (*In German.*) Ein Gerät zur Bestimmung des Gasgehaltes von Aluminiumlegierungen beim Schmelzen und Giessen. ***C. E. Ransley, D. E. J. Talbot, and H. C. Barlow.*** *Aluminium (Dusseldorf)*, v. 34, Nov. 1958, p. 643-646.

1775* The Composition Range of Ti_2Ni. ***G. A. Yuko, J. W. Barton, and J. Gordon Parr.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society*, v. 212, no. 5, Oct. 1958, p. 698-700.

1776* Relations of High-Temperature Properties of a Ti + Al Hardened Nickel-Base Alloy to Contamination by Crucibles. During vacuum induction melting the major variable was the type of ceramic used for the crucible. Analytical studies of the materials by industrial concerns indicated that trace amounts of zirconium or boron were derived from the crucibles. This reduced cracking during hot working and increased rupture strength and ductility. Heats made in alumina crucibles had poor characteristics. Zirconium derived from zirconia crucibles improved characteristics. Boron derived during melting from the usual contamination of magnesia with borate compounds was more beneficial than zirconium. Equivalent additions of zirconium or boron to heats made in alumina produced properties comparable to those heats made in zirconia or magnesia. ***R. F. Decker, John P. Rowe, and J. W. Freeman.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society*, v. 212, no. 5, Oct. 1958, p. 686-694.

1777 Medium and Low Tungsten High-Speed Steels Alloyed With Cobalt. High-speed steels giving superior performance in machining operations entailing impact-like stresses. Results obtained with cyaniding and sulfidizing; and on the life of cutting tools of the various steels. ***M. S. Chaadaeva.*** *Henry Brutcher Translation No.* 4177, 11 pp. (From *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1958, p. 48-53.) Henry Brutcher, Altadena, Calif.

1778 Composition vs. Hot Strength Diagrams of Alloys of the Titanium-Vanadium-Columbium System. Phases present in the Ti-V-Cb system. ***V. S. Vlasov and I. I. Kornilov.*** *Henry Brutcher Translation No.* 4346, 11 pp. (From *Izvestiya Akad. Nauk SSSR, Otd. Tekh. Nauk*, no. 7, July 1958, p. 136-139.) Henry Brutcher, Altadena, Calif.

1779 Future Metals. Tungsten, tantalum, molybdenum, chromium, vanadium, niobium, and rhenium appear to have the best potentialities for extending the limits of present-day materials of construction. Each of these metals has attractive properties such as good strength at high temperatures and/or corrosion resistance, which make them suitable for use in the fields of chemical equipment, high-temperature jet engines, rocket motors, high mach number airframes, and missiles, and other specialized applications. ***H. R. Ogden.*** *Chemical Engineering Progress*, v. 54, Nov. 1958, p. 54-57.

1780* Metals and Alloys Review. The first issue of a quarterly publication which will provide data on properties and uses of ferro-alloy and metals. In this issue, chrome, ductile iron, stainless steel and titanium. *Electromet Metals and Alloys Review*, v. 1, no. 1, Fall 1958, 33 pp.

1781 The Upper Temperature Limit of Stability of G.P. Zones in Ternary Aluminium-Zinc-Magnesium Alloys. The metastable boundary for G.P. zone formation has been determined. ***I. J. Polmear.*** *Institute of Metals, Journal*, v. 87, pt. 1, Sept. 1958, p. 24-25.

1782 Toughen Mild-Carbon Steels With Columbium. Adding small amounts of Cb refines the grain to boost strength and weldability. *Iron Age*, v. 182, no. 18, Oct. 30, 1958, p. 96.

1783 High Speed Steel. Development of a New Type With 5% W and 5% V. Hardness values of a high-speed steel, containing 1.25-1.40% carbon, about 5% tungsten and about 5% vanadium, suggest that this steel could usefully and economically replace the usual 12-18% tungsten high-speed steels for various purposes. ***Paul Kövesi.*** *Iron & Steel*, v. 31, no. 12, Nov. 1958, p. 529-533.

1784 A Study of the Compatibility of Some Creep-Resistant Steels With Liquid Bismuth in Non-Isothermal Systems. The compatibility of a series of low-carbon ferritic steels with liquid bismuth and the variation in their resistance to attack and mass transfer with composition and with particular reference to chromium content has been investigated for non-isothermal systems. ***D. W. Dawe, G. W. Parry, and G. W. Wilson.*** *Iron and Steel Institute, Journal*, v. 190, pt. 3, Nov. 1958, p. 271-276.

1785 Thermal Conductivity and Thermoelectric Power of Germanium-Silicon Alloys. It is shown that solid-solution alloying can significantly increase the figure of merit of thermoelectric materials. ***M. C. Steele and F. D. Rosi.*** *Journal of Applied Physics*, v. 29, Nov. 1958, p. 1517-1520.

1786 Roll-Compacting Produces Pure Nickel Strip. Nickel strip with excellent mechanical properties has been prepared by roll-compacting pure nickel powders, sintering, and re-rolling the sintered compact. ***J. A. Lund.*** *Journal of Metals*, v. 10, Nov. 1958, p. 731-734.

1787 Beryllium. Its Problems and Possibilities. Summary of the report of the Materials Advisory Board Panel on Be. Prospects for future use of Be as a structural material and the problems involved. ***Joseph R. Lane.*** *Journal of Metals*, v. 10, Nov. 1958, p. 738-742.

1788 Properties of Materials. Irons and Steels. Physical, mechanical, corrosion, fabricating and joining properties of four irons and 20 steels. *Materials in Design Engineering*, v. 48, Mid-Oct. 1958, p. 31-65.

1789 Properties of Materials. Nonferrous Metals. Composition; mechanical, fabrication and corrosion properties, available forms, applications. *Materials in Design Engineering*, v. 48, Mid-Oct. 1958, p. 83-123.

1790 Mond Nickel Research Laboratory. Describes research in development of high-temperature and other special alloys by the International Nickel Co. *Metal Industry*, v. 93, Oct. 24, 1958, p. 355-358.

1791 High-Temperature Metallurgy Today. Surveys the most promising areas for high-temperature development and gives the best alloys among the light metals and steels. ***L. P. Jahnke and R. G. Frank.*** *Metal Progress*, v. 74, no. 5, Nov. 1958, p. 77-82.

1792* Rare Metals—Past, Present, Future. Economic aspects—supply and marketing. ***M. H. Kline.*** *Metals*, v. 29, no. 4, Oct. 1958, p. 11 + 1 page.

1793 Physical Metallurgy of Uranium. Radioactivity and nuclear reactions; crystallography, transformation, recrystallization, and diffusion characteristics; physical and mechanical properties; deformation behavior; thermal-cycling growth; radiation damage. Design of fuel elements. ***A. N. Holden.*** 262 pp. 1958. Addison-Wesley Publishing Co., Reading, Mass. (TN693.U7 H71p)

1794 Wanted: A Revolution in Manufacturing. Survey of research by various metalworking firms in the fields of machining, forming, casting, welding, and heat treating. *Steel*, v. 143, Nov. 24, 1958, p. 100-103.

1795 Thorium Production Technology. Reviews history, ores, uses, properties, extraction, refining, fabrication, health and safety measures, powder metallurgy, and test procedures for Th and its alloys, and for Th compounds. ***F. L. Cuthbert.*** 303 pp. 1958. Addison-Wesley Publishing Co., Reading, Mass. (TN799.T4 C97t)

1796* **Titanium.** Properties of Ti which make it useful to the aircraft industry. (*In French.*) Le titane. **Pierre Vachet.** *Métaux Corrosion-Industries*, v. 33, Sept. 1958, p. 353-365.

1797 New High Temperature Intermetallic Materials. The investigation included five ternary systems and a number of rare earth intermetallic compounds. Addition of Mo to Cr_2Ti improved its strength behavior while Cr, Ti or Cb did not. Zr improved mechanical properties but not oxidation resistance. X-ray identification and physical properties of some rare earth aluminides and silicides are presented. ***R. D. Grinthal.*** *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 53-190, May 1958, 80 pp. (TL507 Un3.18w Vis.)

1798 The Gaseous Equilibria in the Carbon-Silicon Binary System. A method is presented for calculating the pressure and composition of the vapor phase. ***J. Smiltens.*** *U. S. Air Force, Cambridge Research Center, TR*-58-161, July 1958, 34 pp. (TK7800 Un3.12b Contin.)

1799 Argonne National Laboratory Quarterly Report, April, May, and June 1957, Metallurgy Division. The report discusses the following programs: (1) advanced water reactor, (2) fast power breeder reactor, (3) general reactor development, (4) production, treatment, and properties of materials, (4) alloy theory and the nature of solids. *U. S. Atomic Energy Commission, ANL*-5790, July 1958, 60 pp. (UF767 Un3.1an Contin.)

1800 Semi-Annual Summary Research Report in Metallurgy for July-Dec. 1957. The report is an account of Government sponsored work at Ames Laboratory. *U. S. Atomic Energy Commission, ISC*-977, Aug. 15, 1958, 101 pp. (UF767 Un3.1is Contin.)

1801 Tabulation, Bibliography, and Structure of Binary Intermetallic Compounds. IV. Compounds of Zinc, Cadmium, and Mercury. 208 References. ***R. M. Stanton, et al.*** *U. S. Atomic Energy Commission, ISC*-1047, Aug. 1, 1958, 50 pp. (UF767 Un3.1is Contin.)

1802 The Uranium-Platinum System. Development of the constitution diagram by correlation of data obtained by thermal analysis, X-ray diffraction, and microscopic analysis. ***J. J. Park and D. P. Fickle.*** *U. S. Atomic Energy Commission, NBS*-5946, June 19, 1958, 30 pp. (UF767 Un3.1nb Contin.)

1803 Determination of Oxygen in Lithium Metal. A successful method was developed based on the conversion of the oxide oxygen to water and determination of the water thus formed with Karl Fischer reagent. ***N. I. Sax and S. Steinmetz.*** *U. S. Atomic Energy Commission, ORNL*-2570, Oct. 31, 1958, 10 pp. (UF767 U3o Contin.)

1804 Research and Development in the Field of Thorium Chemistry and Metallurgy. v. I. Preparation of Electrolytic Cell Feed for Production of Thorium Metal. A commercially feasible approach for the preparation of high quality anhydrous electrolytes suitable for conversion to A.E.C. grade thorium metal by electrolytic techniques. ***Charles E. Fisher and James L. Wyatt.*** *U. S. Atomic Energy Commission, SRO*-11, June 30, 1956, 135 pp. (UF767 Un3.1sr Contin.)

1805 Heat Transfer and Thermal Stresses in Sandwich Panels. Calculated maximum temperature differences between faces and calculated thermal stresses are presented for sandwich panels with a prescribed linear rate of temperature rise at one face and with the other face insulated. ***Robert T. Swann.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4349, Sept. 1958, 34 pp. (TL570 Un3t Vis.)

1806* **Cold Extrusion for High Temperature Metals.** Status of development of the cold extrusion process for SAP, steel, Mo, Zr, Ti, and Cb. ***Ray Quadt.*** *Western Metalworking*, v. 16, Nov. 1958, p. 45-47.

METALS—CORROSION

1807* **Oxidation Resistance of a Cb-Zr-Ti Alloy.** ***G. M. Gordon, J. W. Spretnak, and Rudolph Speiser.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society*, v. 212, no. 5, Oct. 1958, p. 659-660.

1808 Surface Treatment of 14-14 Austenitic Steel to Improve Its Resistance to Inter-Granular Corrosion. A suitable heat treatment ensuring surface decarburization. ***Yu. N. Gribodov.*** *Henry Brutcher Translation No.* 4176, 10 pp. (From *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1958, p. 42-48.) Henry Brutcher, Altadena, Calif.

1809 Galvanic Corrosion. II. Effect of *p*H and Dissolved Oxygen Concentration on the Aluminum-Steel Couple. High-purity aluminum cathodically protects steel completely in chloride solutions within the *p*H range 0.2-14.0. ***M. J. Pryor and D. S. Keir.*** *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 629-634.

1810 The Mechanism of Passivating-Type Inhibitors. Data are presented for passivation of stainless steel and titanium. The mechanism is discussed in terms of various oxidizing agents including oxygen, chromate, molybdate, and pertechnetate. ***Milton Stern.*** *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 638-647.

1811 A Study of Corrosion Films on Zirconium and Its Alloys by Impedance Measurements. Oxide films formed during exposure to steam and water at 325 C. ***J. N. Wanklyn and D. R. Silvester.*** *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 647-654.

1812 The Reaction of Germanium With Aqueous Solutions. I. Dissolution Kinetics in Water Containing Dissolved Oxygen. The dissolution of germanium in water was studied as a function of oxygen partial pressure, temperature, crystallographic orientation, and mobile-carrier density. ***Walter W. Harvey and Harry C. Gatos.*** *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 654-660.

1813 Pitting Corrosion. The problem is discussed of finding a method for determining resistance to pitting corrosion that will give general corrodibility and also allow estimates of the maximum rate of penetration likely to occur. Corrosion of four aluminum alloys was examined. *Metal Industry*, v. 93, Nov. 7, 1958, p. 397-398.

1814* **Design From the Viewpoint of Corrosion.** This review is concerned with the application of common sense and theoretical concepts in combination with measured corrosion rates to obtain optimum design of a piece of equipment. ***W. D. Clark.*** *Metallurgical Reviews*, v. 3, no. 11, 1958, p. 279-325.

1815 The Effect of Atmospheric Corrosion on Metal Fatigue. Polycrystalline specimens of Cu, Al, and Au were fatigued in reversed bend in various pressures of air and in water and inert gases. ***N. J. Wadsworth and J. Hutchings.*** *Philosophical Magazine*, v. 3, ser. 8, Oct. 1958, p. 1154-1166 + 1 plate.

1816 Studies of the Corrosion Behavior of Non-Siccative Oils and Fats With Special Consideration of Modern Lubricants and Preservative for Metals. Corrosive effects of non-drying oils and fats and of their impurities on metals; use of these oils and fats as surface protection against water, aqueous saline solutions and acid vapors. Corrosive properties of mineral oils with or without additions, machine fats, synthetic lubricants. Protective capacity of oils and greases used on metallic parts. (*In German.*) Studien über das Korrosionsverhalten nichttrocknender Öle und Fette unter besonderer Berücksichtigung moderner Schmiermittel und Konservierungsmittel für Metalle. ***A. Bukowiecki.*** *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 24, July 1958, p. 201-217.

1817 The Effect of Reactor Atmosphere on Zirconium and Zirconium Alloys. Zirconium, Zircaloy-2 and Zircaloy-3b specimens were exposed to a 50 v/o helium 50 v/o carbon dioxide reactor atmosphere at a weighted average temperature of 430 C for a total of 886 days at temperature. The rate of corrosion of zirconium and Zircaloy-2 is represented by empirical equations. ***R. G. Wheeler.*** *U. S. Atomic Energy Commisison, HW*-55958, May 6, 1958, 13 pp. (UF767 Un3.1hw Contin.)

1818 The Corrosion of Zirconium Alloys in 900° F Steam. Additions of nickel, chromium, and, to a lesser extent, iron, extend the life of zirconium-base alloys to as long as sixty days before spalling commences ***J. Paul Pemsler.*** *U. S. Atomic Energy Commission, NMI-1208,* Aug. 18, 1958, 24 pp. (UF767 Un3.1nm Contin.)

1819 Loop Studies on the Behavior of Preformed ZrO_2 in Uranyl Sulfate Solution. 0.04 *m* UO_2SO_4 solution circulated in three pumped loops showed deposition on surfaces dependent on loop geometry, flow conditions, surface conditions, and other parameters. ***R. W. Horton, J. R. Bowen, and P. A. Haas.*** *U. S. Atomic Energy Commission, ORNL-2577,* 19 pp. (UF767 U3o Contin.)

1820 An Investigation of the Effects of Atmospheric Corrosion on the Fatigue Life of Aluminum Alloys. 2024-T3 and 7075-T6 aluminum alloys in both the bare and clad forms were tested. ***Herbert A. Leybold, Herbert F. Hardrath, and Robert L. Moore.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4331, Sept. 1958, 17 pp. (TL570 Un3t Vis.)

1821* Protective Films in Passivity. To determine whether passivity is due to (1) a three-dimensional film (2) a two-dimensional film (chemisorbed material) or (3) a change within the metal or alloy. The evidence supports the idea that a three-dimensional film is usually necessary. ***U. R. Evans.*** *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für Physikalische Chemie,* v. 61, nos. 6/7, 1958, p. 619-626.

1822* The Adsorption Theory of Passivity and the Flade Potential. From quantitative data reported by various investigators, it is concluded that the primary passive film on iron has the following properties: (1) 25-100 Å thick, (2) equivalent to 0.01 coulomb/cm^2, (3) can oxidize CrO_2^- to CrO_4^{--}, (4) follows the (Flade) potential relation $-0.58 + .058$ *p*H (volts). All these properties cannot be accounted for by any of the known oxides of iron. In better accord with the facts is a proposed passive film composed of chemisorbed atomic and molecular oxygen supplemented perhaps by OH and H_2O. ***Herbert H. Uhlig.*** *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für Physikalische Chemie,* v. 61, nos. 6/7, 1958, p. 626-632.

1823* Sorption, Oxidation and Passivity. The strikingly large initial effects observed in passivation phenomena are attributed to a temporary change associated with sorption of a suitable specie onto the clean metal in an amount corresponding to about a monolayer. It is agreed that permanent passivity stems from a thin, insoluble film of a compound of the metal but it is suggested that it forms by migration of the metal ion into the array displayed by the sorbed species. It is postulated that the more nearly a complete sorbed monolayer forms before metal ion migration starts the more likely is the formation of a defect-free, fissure-free compound film. ***Norman Hackerman.*** *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für Physikalische Chemie,* v. 61, nos. 6/7, 1958, p. 632-637.

1824* Electrochemical Behaviour and Anodic Passivity Mechanism of Certain Metals in Electrolyte Solutions. Chromium, nickel, and stainless steel (grade 18-8) were studied by the potentiostatic method in a broad range of polarizations. The steady dissolution rate (I_{ss}) as a function of the potential for all the investigated metals was found to be expressed by curves similar in shape. ***Y. M. Kolotyrkin.*** *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für Physikalische Chemie,* v. 61, nos. 6/7, 1958, p. 664-669.

1825* The Passivation Process in the Presence of the XO_4^{n-} Inhibitors. Behavior with respect to the corrosion of iron and steel was studied. Results support the view that a competitive adsorption of the effective inhibitors is involved in their action, and that their specificity derives from an internal difference other than precipitating power and ionic charge or configuration. ***G. H. Cartledge.*** *Zeitschrift für Elektrochemie; der Bunsengesellschaft für Physikalische Chemie,* v. 61, nos. 6/7, 1958, p. 684-690.

1826* Anaerobic Corrosion of Metals in Solutions Containing Various Metallic Cations—Inactivation and Activation. Three cases are cited: the inactivation of iron by Sn(II) and Pb(II) ions in boiling 0.2 M citric acid; the inactivation of nickel by Cu(II) ions in boiling 2 M HCl; and the inactivation of titanium in boiling 2M HCl by the Group VIII metals, Rh, Ru, Pd, Ir, Os, and Pt. Experiments on the activation of Al, Cu, Fe, Ni, Ag, Sn, and Zn in boiling acids by the Group VIII metals are also described. ***W. Roger Buck and Henry Leidheiser, Jr.*** *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für Physikalische Chemie,* v. 61, nos. 6/7, 1958, p. 690-695.

1827* The Passivity of Iron in Chromate Solutions. I. Structure and Composition of the Film. *M. Cohen and A. F. Beck.* *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für Physikalische Chemie,* v. 61, nos. 6/7, 1958, p. 696-699.

1828* Electron Configuration in Alloys and Passivity. Passivity in the transition metal alloys occurs at specific critical compositions which appear to be related to *d*-electron vacancies in the component metals and their tendency to fill with electrons. The *d* vacancies, measured in part by the magnetic saturation moment, favor formation of strongly chemisorbed surface films, e.g. oxygen, which confer increased resistance to corrosion or passivity by satisfying metal surface affinities. ***Herbert H. Uhlig.*** *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für Physikalische Chemie,* v. 61, nos. 6/7, 1958, p. 700-707.

1829* The Sorption of Some Diatomic Gases on Stainless Steel and Iron Surface and Its Relation to Passivity. The mechanism by which 18 Cr–8 Ni stainless steel becomes passive after the sulfuric acid pickle–air exposure treatment is probably one of oxidation. The protective film is most likely an amorphous hydrous oxide. The quantity of oxygen required for saturation is less than half the amount necessary to produce a molecular monolayer. ***William P. McKinnell, Jr., Rudolph Speiser, M. G. Fontana, and F. H. Beck.*** *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für Physikalische Chemie,* v. 61, nos. 6/7, 1958, p. 733-739.

METALS—EXTRACTION AND REFINING

1830* Production and Properties of Iodide Niobium. (*In Russian.*) Poluchenie i svoĭstva ĭodidnogo niobiia. ***D. M. Chizhikov and A. M. Grin'ko.*** *Akademiia Nauk SSSR, Doklady,* v. 122, no. 2, Sept. 11, 1958, p. 278-279.

1831 Research on the Use of Pure Oxygen in Refining Processes. II. *Paul Metz.* *Blast Furnace and Steel Plant,* v. 46, Nov. 1958, p. 1187 + 5 pages.

1832 Study of Blast Furnace Process by Isotope Methods. Principle of the currently used isotope methods for blast furnace studies and their advantages over indirect methods. ***I. P. Bardin, P. L. Gruzin, and S. V. Zemskii.*** *Henry Brutcher Translation No.* 4305, 9 pp. (From *Doklady Akademii Nauk SSSR,* v. 114, no. 6, 1957, p. 1220-1223.) Henry Brutcher, Altadena, Calif.

1833 High-Purity Crystalline Boron. Vapor phase reduction of boron trichloride with hydrogen on electrically heated filaments in flow systems was investigated as a potential method for the preparation of high-purity boron. Massive deposits of crystalline boron analyzing as high as 99.6% by direct chemical analyses were obtained. ***David R. Stern and Lahmer Lynds.*** *Electrochemical Society, Journal,* v. 105, Nov. 1958, p. 676-682.

1834 Quality Control in Specialty Steel Production. Four factors—scrap, composition, temperature and design—influence ingot quality. Control of these variables produced ingots with consistent properties from heat to heat. ***J. S. Pendleton, Jr. and H. O. Beaver, Jr.*** *Metal Progress,* v. 74, no. 5, Nov. 1958, p. 100-103.

1835 Oxygen Enrichment in Iron and Steel Making. The introduction of an oxygen enriched blast into the conventional blast furnace has opened up the possibilities of improved output at economical costs. *Metallurgia,* v. 58, Oct. 1958, p. 187 + 1 page.

1836* Production and Properties of Sheets Made of Stainless Steel Killed by Aluminum. Production of killed stainless steel, suitable for manufacture of "VGV" grade cold-rolled sheets from undressed slabs; deoxidation with Al shot, pouring it into ingot molds and at the end of filling the molds. This ensures better surface quality of sheets than those produced by deoxidation of the steel by Al in the ladle. (*In Russian.*) Proizvodstvo i svoĭstva uspokoennoĭ aliuminiem nestareiuscheĭ listovoĭ stali. ***D. A. Litvinenko, A. I. Marinov, V. K. Barzii, and V. I. Iakushin.*** *Stal'*, v. 18, no. 10, Oct. 1958, p. 931-938.

1837 Hafnium Metal Powder by the Hydride-Dehydride Process. The process has been proven by the manufacture of 150 lb. of high quality powder. Limited tests indicate excellent corrosion resistance in parts made from this powder. ***R. N. Honeyman and C. T. Waldo.*** *U. S. Atomic Energy Commission, KAPL*-1929, May 6, 1958, 13 pp. (UF767 Un3.1ka Contin.)

See also: **1305** (production of dense, high strength high-alumina materials); **1306** (processes of destruction of refractory materials); **1361** (preparation of Po metal); **1449** (uranium extraction); **1630** (oxidation mechanism in the open hearth furnace).

METALS—FINISHING, POLISHING, AND CLEANING

1838 Studies of Structure and Adhesion of Scale on Plain-Carbon Steel Plates. Factors controlling the adhesion of (roll) scale to rimmed and killed steels. ***H. J. Engell and F. -K. Peters.*** *Henry Brutcher Translation No.* 4329, 22 pp. (From *Archiv Eisenhüttenwesen*, v. 28, no. 9, 1957, p. 567-574.) Henry Brutcher, Altadena, Calif.

1839 Finishing Zinc Base Die Castings. Polishing and buffing after a preliminary cleaning cycle. ***Lester Spencer.*** *Metal Finishing*, v. 56, Nov. 1958, p. 58-61.

1840* Vacuum Depositions of Metals. At present the possibilities of the method are becoming more and more apparent to industry and new applications are continually being recognized. ***G. B. Remond and A. R. Johnson.*** *Metal Finishing Journal*, v. 4, no. 46, Oct. 1958, p. 393-397.

1841 More Surface Polishing. Less Galling. Test results to show why components should be "worn in" before they take loads and why cast irons are less likely to gall than steels or brasses. ***William H. Moore.*** *Product Engineering*, v. 29, no. 48, Nov. 24, 1958, p. 63-65.

1842 Selecting Cleaning and Surface-Preparation Equipment. Cost-saving ideas that aid in modernizing old equipment and installing new equipment. ***S. J. Barlett.*** *Products Finishing*, v. 23, no. 2, Nov. 1958, p. 56-57.

1843 Improving the Finish of Tinned Wares. Article discusses problems of drainage and centrifuging. *Tin and Its Uses*, 1958, no. 44, Autumn, p. 4-5.

METALS—FOUNDRY PRACTICE

1844* Development Trends in Pressure Die Casting in the USA. In large pressure die casting machines with up to 2000 m. tons closing pressure aluminium parts weighing up to 75 lbs. can be made. (*In German.*) Entwicklungstendenzen beim Druckguss in den USA. ***A. F. Bauer.*** *Aluminium (Dusseldorf)*, v. 34, Nov. 1958, p. 647-648.

1845* Temperature Control in Pressure Die Casting. Monitoring heat exchange and thermal equilibrium provides the perconditions for fully automatic control devices in the cooling water circulation and/or the heating equipment. (*In German.*) Temperaturüberwachung beim Druckgussverfahren. ***A. F. Bauer.*** *Aluminium (Dusseldorf)*, v. 34, Nov. 1958, p. 648-651.

1846 A Modern Melting Process for the Production of Metals and Alloys of Highest Purity. Complete description of a laboratory arc 'crucible-less' vacuum furnace. ***W. Scheible.*** *Henry Brutcher Translation No.* 4241, 10 pp. (Slightly Abridged Translation from *Metall*, v. 11, no. 10, 1957, p. 854-859.) Henry Brutcher, Altadena, Calif.

1847 Study of Secondary Cooling [With Air-Water Mixtures] in Continuous Casting. Continuous-cast billets with mixtures of water and air instead of water sprays alone. ***A. D. Akimenko, et al.*** *Henry Brutcher Translation No.* 4310, 5 pp. (From *Stal'*, v. 18, no. 6, 1958, p. 509-511.) Henry Brutcher, Altadena, Calif.

1848 Remelting of Steel and Alloys in Vacuum Arc Furnace. Experiments on the removal of gas and non-metallic inclusions. ***G. N. Okorokov, A. Yu. Polyakov, and A. M. Samarin.*** *Henry Brutcher Translation No.* 4339, 7 pp. (From *Izvestiya Akademii Nauk SSSR, Otd. Tekhn. Nauk*, no. 5, May 1958, p. 59-62.) Henry Brutcher, Altadena, Calif.

1849 Ingot Molds Chill Cast of Magnesium-Treated Cast Iron. Plant-scale trials regarding the performance of chill-cast ingot molds of Mg-treated cast iron, compared with ordinary gray iron. ***G. A. Pisarenko, S. G. Guterman, Yu. I. Aizikovich, and P. D. Elokhov.*** *Henry Brutcher Translation No.* 4342, 12 pp. (From *Stal'*, v. 18, no. 7, 1958, p. 668-672.) Henry Brutcher, Altadena, Calif.

1850 Ten-Gram Levitation-Melted Ingots. Melts of about 10 grams in a protective atmosphere are described. Shapes can be cast. An approximate formula for levitating force is given. ***G. Comenetz and J. W. Salatka.*** *Electrochemical Society, Journal*, v. 105, Nov. 1958, p. 673-676.

1851* New Horizons in Precision Casting. Reduction of Production Costs by Means of the New "Shaw" Precision Molding Process. Using refractory material prepared in the molten state. Volatile matters are eliminated by thermal shock immediately after molding. The "Shaw" mass is poured directly on the patterns, thus allowing perfect imitation. Solidification by controllable chemical reaction within a few seconds to a few minutes. (*In Italian.*) Nuovi orizzonti per la fonderia di precisione ridurre i costi di produzione con il nuovo procedimento "shaw" per formatura di precisione. *Fonderia*, v. 7, Sept. 1958, p. 417 + 3 pages.

1852 Solves Casting Problem. At Morse Instrument Co., shell molding proved the answer to production of bronze castings suitable for chrome plating or buffing to a high luster. Shell molded Al castings also are made. ***Edwin Bremer.*** *Foundry*, v. 86, Nov. 1958, p. 83-85.

1853* Fabrication of Thin-Walled Linings of Bearing According to the Die Casting Method. Description of equipment used; 2 mm. thick linings are obtained by applying the die casting method. Subsequent removal of metal by cutting and tinning of bearing boxes are eliminated. Satisfactory casting of bearing alloys rich in lead such as Bn-metals. (*In German.*) Die Herstellung dünnwandiger Legerausgüsse nach dem Druckgiessverfahren. ***Heinrich Backof.*** *Giessereitechnik*, v. 4, Aug. 1958, p. 188-191.

1854 Continuous Casting of High-Speed Steel. Paper describes a continuous-casting plant operated on a pilot scale for the production of high-speed steel and other alloy steels. ***B. H. C. Waters, W. H. Pritchard, A. Braybrook, and G. T. Harris.*** *Iron and Steel Institute, Journal*, v. 190, pt. 3, Nov. 1958, p. 233-248.

1855* Study on Ceramic Investment Strength in the Lost-Wax Process. (*In Russian.*) Issledovanie prochnosti keramicheskikh obolochek v proizvodstve lit'ia po vyplavliaemym modeliam. ***O. V. Stupishina.*** *Liteĭnoe Proizvodstvo*, 1958, no. 9, Sept., p. 14-17.

1856* Effect of Technological Factors on Investment Strength in the Lost-Wax Process. (*In Russian.*) Vlianie tekhnologicheskikh faktorov na prochnost' obolochki pri lit'e po vyplavliaemym modeliam. ***M. T. Bogdanov.*** Liteĭnoe Proizvodstvo, 1958, no. 9, Sept., p. 18-20.

1857 Babbitting Bearings by Centrifugal Force. The low strength of babbitt metal is overcome by bonding a thin layer of babbitt to a strong backing material. An improved centrifugal casting method results in a more uniform structure in the bearing metal. ***W. B. Keyser.*** *Metal Progress*, v. 74, no. 5, Nov. 1958, p. 90-91.

1858* Vacuum-Electric Arc Melting With Consutrodes. The alloy is melted as electrode in the electric arc in vacuum in a water-cooled copper crucible. Operation cycle when melting Ti or Zr by means of two porous electrodes for the first melt. Better degasification of the metal, greater stability of the arc, rarer crucible perforations. Future possibility in skull melting. (*In German.*) Vakuum-Lichtbogenschmelzen mit Abschmelzelektrode. ***H. Gruber.*** *Metall*, v. 12, Oct. 1958, p. 901-912.

1859* Segregations in Casting Alloy Pigs, Especially of the G-AlMg and G-AlSiCu Types. In cross and longitudinal sections of pigs of these alloys, of G-MgAl9Zn2 and of red bronze Rg10, the contents at various points were determined. In Al alloys the contents at the contraction zone were about 10 to 30% lower than the average contents. (*In German.*) Über Seigerungen in Gusslegierungsmasseln, insbesondere der Gattungen G-AlMg und G-AlSiCu. ***A. Buckeley.*** *Metall*, v. 12, Oct. 1958, p. 918-921.

1860 When Melting Aluminum. Selection of furnaces and flux and training of operators. ***John J. Stobie.*** *Modern Metals*, v. 14, no. 10, Nov. 1958, p. 40 + 3 pages.

1861 Transactions of the American Foundrymen's Society, Proceedings of the Sixty-Second Annual Meeting. v. 66, 624 pp. 1958. American Foundrymen's Society, Des Plaines, Ill. (TS200 Am35t Vis.)

1862* Production of Huge Mechanite Castings Succeeds With Unique Fixturing, Pouring Methods. Description of foundry practice used in pouring a 66,000 lb. radiation shielding door of GA series Meehanite. ***Bill Durkee.*** *Western Metalworking*, v. 16, Nov. 1958, p. 43-44.

1863* The Various Effects of the Vacuum Melt on Gas Contents in Metals. Several iron and nickel melts were examined with respect to oxygen, nitrogen and hydrogen content. By comparison of the gas contents of basic materials and of open and vacuum melted iron and nickel charges, the causes of the lower gas contents of vacuum melts were found. (*In German.*) Über die verschiedenen Einflüsse des Vakuumschmelzens auf Gasgehalte in Metallen. ***Irmtraud Pfeiffer.*** *Zeitschrift für Metallkunde*, v. 49, Sept. 1958, p. 455-460.

1864* Quantitative Evaluation of Volatilization During Application of the Floating Zone Method. Concentration curves produced by zone melting in high vacuum are drastically altered, when the impurity element is volatile. Applying the floating zone method the zone melting process was quantitatively investigated in the case of phosphorus in silicon. (*In German.*) Quantitative Berücksichtigung der Abdampfung beim tiegelfreien Zonenschmelzen. ***Günther Ziegler.*** *Zeitschrift für Metallkunde*, v. 49, Sept. 1958, p. 491-494.

See also: **2252** (air pollution control for foundries); **2338** (welding of iron castings).

METALS—HEAT TREATMENT

1865* Sulphurization of Silver Alloys With Copper in Boiling Sulphur. Copper content from 0.0 up to 100%. The rate of sulphurization of alloys rich in copper occurs according to the parabolic law, and for those rich in silver according to the linear law. In the range of copper concentration between 75 and 50% in the alloy, there appears a passage between the parabolic and linear law. (*In Polish.*) Siarkowanie stopów srebra z miedzią we wrzącej siarce. ***Lucjan Czerski, Stanisław Mrowec, Krystyna Wallischt, and Teodor Werber.*** *Archiwum Hutnictwa*, v. 3, no. 3, 1958, p. 149-159 + 1 plate.

1866 High-Power Quenching Media. New 'characteristic curves' for pure water, and for aqueous solutions of common salt and caustic soda, circulating or still, at various temperatures. Factors accelerating drop of surface temperature of steel being quenched. ***L. V. Petrash.*** *Henry Brutcher Translation No.* 4179 ,10 pp. (From *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1958, p. 56-61.) Henry Brutcher, Altadena, Calif.

1867* Welding Involves Heat Treatment Study. Presents heat treatment in shop floor language as an aid to obtaining greater welding performance. ***H. Thomasson.*** *Canadian Metalworking*, v. 21, Nov. 1958, p. 50 + 1 page.

1868 New Heat Treatment Department. Modern Plant at Darley Dale. Describes modernization of heat treatment facilities. *Iron & Steel*, v. 31, no. 12, Nov. 1958, p. 547-548.

1869 Universal Heat-Treatment Furnace. Stress Relieving Large Welded Fabrications. Furnace was designed and installed specially to meet the exacting heat treatment requirements for large nuclear power vessels being made in the heavy plate welding and construction shop. *Iron & Steel*, v. 31, no. 12, Nov. 1958, p. 549-550.

1870 Heat Treating Large Aluminum Extrusions. New horizontal furnace prevents warping. *Light Metal Age*, v. 16, Oct. 1958, p. 14-15.

1871 Tempering Type 410 Stainless Steel. An adaptation of the Hollomon-Jaffe tempering parameter has made it possible to devise simple charts, usable by shop personnel. Retempering has been cut to a minimum. ***Charles F. Lewis.*** *Metal Progress*, v. 74, no. 5, Nov. 1958, p. 88-89.

1872* Increasing the Durability of Hardened Steel Rolls by Means of Low-Temperature Tempering. The rather poor durability of the hardened steel rolls may be increased considerably by removing the internal stresses in rolls by means of additional tempering at 165-180 C during six hours. (*In Russian.*) Povyshenie stoĭkosti zakalennykh stal'nykh valkov putem dopolnitel'nogo otpuska. ***N. S. Vasil'chenko.*** *Stal'*, v. 18, no. 10, Oct. 1958, p. 917-920.

1873 Furnace Slashes Annealing Costs in Half. Continuous operation through annealing and relubrication of deep drawn parts has eliminated pickling and reduced material handling. The investment has a three-year payoff. *Steel*, v. 143, Nov. 3, 1958, p. 70-71.

See also: **1988** (annealing in a temperature gradient).

METALS—MECHANICAL AND PHYSICAL PROPERTIES

1874 Aluminum in Rolling Stock; Impact Tests at Collision Speeds. The impact tests at collision speeds reported in this paper demonstrate that aluminum has high impact resistance. Valuable data were obtained on body-to-sill connections and on the performance of draft gear and rear draft lugs in welded railway hopper cars. ***R. A. Campbell, J. G. Sutherland, J. F. Whiting, and R. A. Kemp.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1609-1621.

1875 The Deformation and Fracture of Alpha-Iron at Low Temperatures. The stresses for slip, twinning and cleavage of single crystals of alpha-iron were determined by means of tensile tests at −183 C. The yield behavior at −183 C was studied after twinning had been inhibited by pre-straining at room temperature; values for the upper yield stress were best described by a Cottrell-Bilby type of relation. Twinning occurs as the result of a burst of dislocations released at the upper yield point and is considered to precede fracture, even in those cases where twin formation cannot be detected during testing. ***W. D. Biggs and P. L. Pratt.*** *Acta Metallurgica*, v. 6, Nov. 1958, p. 694-703.

1876 Some Proposals for Evaluating Fatigue Properties of Airplane Structures. The most important proposals are a definition of a Unit Load-Spectrum Period and the expression of spectrum fatigue life in terms of the number of times that the unit spectrum period is repeated. Methods are presented for the design of a structure for a required spectrum life. ***K. O. Lund-***

berg. Aeronautical Research Institute of Sweden, Report No 76, 1958, 36 pp. (TL504 F67m Vis.)

1877* On the Theory of the Development of Real Microcracks in Solids Subjected to Deformation. The analysis shows that a combined conception of true microcracks with the theory of unsettled micro-processes of third and second orders permits an explanation many phenomena observed during deformation and destruction of solids. (*In Russian.*) K teorii razvitiia real'nykh mikrotreshchin v tverdykh telakh v protsessakh deformatsii. ***D. I. Shil'krut.*** *Akademiia Nauk SSSR, Doklady*, v. 122, no. 1, Sept. 1, 1958, p. 69-72.

1878* The Response of Some Light Metal Piston Alloys to Temperature Cycling 634. Normal commercial eutectic and hypereutectic alloys and some sintered materials were subjected to up to 10,000 temperature cycles at up to 200 C, and at higher temperatures up to 350 cycles, at the rate of three per hour. Metallographic studies and fatigue strength determinations. (*In German.*) Das Verhalten einiger Leichtmetall-Kolbenlegierungen bei thermischer Wechselbeanspruchung. ***K. Löhberg, E. Schulz, and W. Jung-König.*** *Aluminium (Dussldorf)*, v. 34, Nov. 1958, p. 634-642.

1879* The Temperature Dependence of the Yield Stress of Copper and Aluminum. In tests on polycrystalline Cu and Al, the ratio of the yield stress to modulus of elasticity was found to be strongly dependent on temperature. ***W. D. Sylwestrowicz.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society*, v. 212, no. 5, Oct. 1958, p. 617-624.

1880* Effect of Complexing on Mechanical Properties of Ti-6Al-3Mo Alloy. Tensile, creep-rupture, and stability tests were employed to evaluate the effect of α-strengthening and β-complexing additions. The ultimate objective was to produce an alloy of greater strength than the Ti-7Al-3Mo alloy. ***F. A. Crossley and W. F. Carew.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society*, v. 212, no. 5, Oct. 1958, p. 630-635.

1881* Concerning the Mechanism of Resistivity Recovery Observed in Cold-Worked Molybdenum. It seems likely that impurity atoms are migrating to dislocations during the 145 C recovery process. ***H. R. Peiffer.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society*, v. 212, no. 5, Oct. 1958, p. 647-648.

1882* The Deformation of Single Crystals of Aluminum. Single crystals of Al oriented for single slip and duplex slip were deformed at 23, 300, and 600 C at creep, normal, and very rapid rates of straining to about 0.035 strain. A detailed study of the crystallography of deformation was made by the optical examination of slip traces and the Laue and Berg-Barrett X-ray techniques. ***J. M. Roberts and K. V. Gow.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society*, v. 212, no. 5, Oct. 1958, p. 648-658.

1883* Determination of the Standard Free Energies of Formation of Zinc Sulfide and Magnesium Sulfide. The standard free energy of formation of ZnS (sphalerite) was determined by studying the equilibrium ZnS (solid sphalerite) + $H_2(g)$ = Zn (g) + H_2S (g) over the temperature range 776 to 937 C. ***W. Curlock and L. M. Pidgeon.*** *American Institute of Mining, Metallurgical and Petroleum Engineers, Transactions, Metallurgical Society*, v. 212, no. 5, Oct. 1958, p. 671-676.

1884* Creep of Polycrystalline Alpha and Beta Thallium. The steady-state creep rate over a large stress range can be described by the empirical formula, $\epsilon = 35\ D\sigma^{5.2}$, where D is the self-diffusion rate in sq. cm. per hr. and σ is the creep stress in kg. per sq. cm. The experimental results suggest that high-temperature creep rate is controlled by a dislocation climb process. ***Oleg D. Sherby.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society*, v. 212, no. 5, Oct. 1958, p. 708-716.

1885* Thermodynamic Properties of Liquid Metallic Solutions. II. The Bi-In System. Investigation by the method of measuring electromotive forces. Reversible elements of the following type were applied:

$$In_{liq.}\ (0.6\ LiBr + 0.4\ KBr) + 0.1\ InBr \mid \underset{liq.}{Bi_x\ In_{1-x}}\ solution$$

Tests were carried on applying 11 alloys of 5 to 95 atomic % of indium in the range of 380 to 520 C. (*In Polish.*) Własności termodynamiczne ciekłych roztworów metali. II. Uklad Bi-In. ***Janusz Terpiłowski.*** *Archiwum Hutnictwa*, v. 3, no. 3, 1958, p. 227-237.

1886 Long-Time Creep and Aging Studies on [Austenitic] Steels La 1 and El 257. Experimental check of creep and rupture strength predictions based on tests of relative short duration. Changes in creep rate, changes in structure, and mechanical properties. ***M. I. Solonouts.*** *Henry Brutcher Translation No.* 4174, 10 pp. (From *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1958, p. 30-34.) Henry Brutcher, Altadena, Calif.

1887 Analysis and Application of Certain Creep Criteria. Usefulness of concept of 'ductility reserve' for establishing permissible stresses and strength safety factors for machines and the like subject to widely differing amounts of creep. ***I. A. Oding and V. S. Ivanova.*** *Henry Brutcher Translation No.* 4211, 11 pp. (From *Vestnik Mashinostroeniya*, v. 35, no. 5, 1955, p. 62-66.) Henry Brutcher, Altadena, Calif.

1888 Friction as Resistance to Shear of Thin Surface Layers on Solids. New method of study of sliding friction between clean metal surfaces entailing the use of freshly cut surfaces and high normal stresses to preclude contaminating surface films. ***G. I. Epifanov.*** *Henry Brutcher Translation No.* 4327, 10 pp. (From *Doklady Akademii Nauk SSSR*, v. 114, no. 4, 1957, p. 764-767.) Henry Brutcher, Altadena, Calif.

1889 Mechanical Properties of Die-Pressed Cast Irons. Die pressing versus chill casting. ***G. K. Gedevanishvili and R. B. Zvenitskaya.*** *Henry Brutcher Translation No.* 4336, 3 pp. (From *Liteinoe Proizvodstvo*, no. 3, Mar. 1958, p. 10-11.) Henry Brutcher, Altadena, Calif.

1890 Modified Keel-Block Design for Acceptance Testing of Ductile Iron. The material required more complex physical testing procedures than did grey iron. The nature of the problem and the means adopted towards its solution are concisely described. ***Gilbert McGlothlin.*** *Foundry Trade Journal*, v. 105, Nov. 6, 1958, p. 563-566.

1891 The Fatigue Properties of Zinc. Fatigue tests were carried out at 18 and −55 C on polycrystalline specimens having a range of grain sizes and at −196 C on zinc single crystals. A tension/compression fatigue machine designed for the fatigue of single crystals at −196 C is described. ***D. M. Fegredo and G. B. Greenough.*** *Institute of Metals, Journal*, v. 87, pt. 1, Sept. 1958, p. 1-9.

1892 The Behaviour of Cold-Worked Copper in Fatigue. Two batches of electropolished specimens, one in the cold worked state and the other annealed, were tested at 16 ksi and 25 ksi in a rotating-cantilever machine running at 6000 c/m. ***D. S. Kemsley.*** *Institute of Metals, Journal*, v. 87, pt. 1, Sept. 1958, p. 10-15.

1893 Preliminary Investigations on the Properties of Chromium and Chromium Alloys at Elevated Temperatures. The high-temperature properties of Cr, and of Cr-10% W and Cr-5% Mo alloys, were assessed by tensile creep tests in air at 950 C. The alloys show considerable promise as high-temperature materials, on the basis of both strength and oxidation-resistance. Structural changes associated with the creep deformation of Cr and the alloys are similar to those previously observed in other metals. Intercrystalline cavities develop during creep, leading to intercrystalline fractures, but certain differences were observed between the cavities in the pure metal and those in the alloys. ***G. R. Wilms and T. W. Rea.*** *Institute of Metals, Journal*, v. 87, pt. 3, Nov. 1958, p. 77-78.

1894 Cleavage Fracture in Cast Chromium of High Purity. The surfaces produced by brittle fracture of cast, coarse-grained, high-purity polycrystalline Cr were examined in detail by means of fractography, goniometry, and X-ray diffraction. Although many features of the fracture of Cr by cleavage are similar to those reported for other metals, there are some features present which have previously been noted only in the brittle fracture of vitreous materials. One of these (Wallner lines) provides an

indirect method of estimating the speed of fracture. ***J. F. McNeil and H. R. Limb.*** *Institute of Metals, Journal*, v. 87, pt. 3, Nov. 1958, p. 79-87.

1895 Heat Treated Ductile Iron Offers Wide Property Range. A number of standard grades can be transformed into a whole new family of engineering materials. ***C. A. Anderson.*** *Iron Age*, v. 182, no. 21, Nov. 20, 1958, p. 102-104.

1896 Variation in Fatigue Properties Over Individual Casts of Steel. II. Investigation of a Cast of Steel to B.S 970 Specification En 24. Variations (a) within an ingot, and (b) between ingots of the same cast of steel. Supplementary metallurgical information concerning composition variations, distribution of non-metallic inclusions, hardenability, and tensile properties was also accumulated. ***E. Ineson, J. Clayton-Cave, and R. J. Taylor.*** *Iron and Steel Institute, Journal*, v. 190, pt. 3, Nov. 1958, p. 277-283.

1897 Effect of Elongation on the Electrical Resistivity of Metals. I. Aluminum. II. Molybdenum. For both Al and Mo, the resistivity caused by point defects and the residual resistivity are directly proportional to the elongation measured at 78 K. ***H. R. Pfeiffer.*** *Journal of Applied Physics*, v. 29, Nov. 1958, p. 1581-1584.

1898 Recent Soviet Literature on Strength—Temperature Relation. (1) theories of strengthening, (2) relation of strength to bond forces and diffusion, (3) theories of high temperature strength, and (4) relation of high temperature strength to phase diagrams. ***R. W. Guard, W. R. Hibbard, Jr., and R. E. Hoffman.*** *Journal of Metals*, v. 10, Nov. 1958, p. 727-730.

1899* Effect of Strain-Temperature History on the Tensile Behavior of Titanium and a Titanium Alloy. Unnotched and notched cylindrical specimens of initially annealed, commerically pure Ti and initially annealed 4% Al-4% Mn Ti alloy were extended at selected temperatures to various true strains and then extended to fracture at another temperature. The ductility retained by the prestrained specimens decreased with increase in the prestrain, whereas the strength indices generally were nearly independent of the amount of the prestraining. However, strength indices obtained on some of the deep-notched specimens of the alloy at −196 C were decreased by prestraining at +25 C as a direct result of the very low retained ductility of the prestrained specimens. ***Glenn W. Geil and Nesbit L. Carwile.*** *Journal of Research, National Bureau of Standards*, v. 61, no. 3, Sept. 1958, p. 173-186.

1900* Considerations on the Strength Behavior of Hard Alloys. Effect of the reciprocal strain of tungsten carbide grain and cobalt bond on the strength behavior of hard alloys. Comparisons with the effect of glasses on ceramic fragments. Pattern of compressive-bending strength as function of Co content was explained as an effect of residual stress. (*In German.*) Einige Betrachtungen zum Festigkeitsverhalten von Hartmetallen. ***W. Späth.*** *Metall*, v. 12, Oct. 1958, p. 925-929.

1901 Some Observations on the Fatigue Behaviour of Aluminium-7% Magnesium in Various Conditions of Heat Treatment. As-extruded Al-7% Mg gave a steel type S-N curve, but any form of heat treatment, whether aging or solution treatment, produced S-N curves typical of those obtained on other Al alloys. Cold working improved the fatigue properties of solution treated material. Partial intercrystalline fatigue failure may occur in materials failing in a transcrystalline manner under unidirectional stress. ***C. A. Stubbington.*** *Metallurgia*, v. 58, Oct. 1958, p. 165-171.

1902 Recrystallisation of Tungsten Wires. From observations of mechanical properties and microstructures, it was found that W wires recrystallize firstly by formation of a columnar structure with good retention of strength and ductility. At higher temperatures, secondary recrystallization occurs with embrittlement and lowered strength. The practically important temperature for onset of this coarsening is very sensitive to the nature of the starting material and its history. A hypothesis is advanced to explain the phenomena and the kinetics of the processes are considered. ***G. L. Davis.*** *Metallurgia*, v. 58, Oct. 1958, p. 177-184.

1903 Some Properties of Zinc-Aluminium Alloys. Presents the results of mechanical tests on Zn-Al alloys containing 2-50% Al. In the cast state, optimum mechanical properties are obtained with a 4% Al alloy. Alloys containing more than 10% Al have poor impact strength, and shrinkage porosity is present in alloys containing more than 20% Al. ***K. P. Scott.*** *Metallurgia*, v. 58, Oct. 1958, p. 188-189.

1904* Fatigue of Metals Caused by a Relatively Few Cycles of High Load or Strain Amplitude. The article discusses particular aspects at low-endurances fatigue. It includes also a general discussion and a discussion of changes in properties caused by plastic cycling. ***P. P. Benham.*** *Metallurgical Reviews*, v. 3, no. 11, 1958, p. 203-234.

1905* Study of Uranium-Molybdenum Alloys. Mechanical and physical properties of alloys up to 30 at.% Mo. (*In French.*) Etude des alliages uranium-molybdène. ***Jean Bellot, Pierre Dosiere, and Jean-Marie Henry.*** *Métaux Corrosion-Industries*, v. 33, Sept. 1958, p. 343-352.

1906 The Ductile-Brittle Transition in the Fracture of α-Iron: I.-II. A criterion for the transition in fracture mode from ductile to cleavage is calculated for fracture at a notch. The expressions obtained for the fracture-mode transition temperature at a notch are shown to agree well with experimental measurements. I. ***M. J. Petch.*** II. ***J. Heslop and N. J. Petch.*** *Philosophical Magazine*, v. 3, ser. 8, Oct. 1958, p. 1089-1097 and p. 1128-1136.

1907 Galvanomagnetic Properties of Cylindrical Fermi Surfaces. The conductivity tensor in an arbitrary magnetic field H is calculated exactly, and then averaged over all orientations of the cylinder axis relative to H. To represent the bulk conductivity of a polycrystalline it agrees with the experimental results on copper. ***J. M. Ziman.*** *Philosophical Magazine*, v. 3, ser. 8, Oct. 1958, p. 1117-1127.

1908 The Magnetization of Cobalt-Aluminium, Cobalt-Silicon, Iron-Aluminium and Iron-Silicon Alloys. The rate of change of magnetic moment with composition in several ferromagnetic cobalt-rich and iron-rich alloys of these systems has been derived from measurements of the variation of spontaneous magnetization with temperature. ***D. Parsons, W. Sucksmith, and J. E. Thompson.*** *Philosophical Magazine*, v. 3, ser. 8, Oct. 1958, p. 1174-1184.

1909 Plastic Creep of Germanium Single Crystals. Three parts are distinguished in the creep curve. A theory is presented in which the initial part is explained in terms of the liberation of dislocation sources from impurity atoms, whereas the stationary creep rate attained in the second part is determined by the mobility of the dislocations themselves. ***H. G. Van Bueren.*** *Physica*, v. 24, Oct. 1958, p. 831-838.

1910 Superconducting to Normal Phase Transition in Tantalum. Measurements were made of the rate at which the superconducting phase collapses radially in a hollow cylindrical Ta specimen following the sudden application of a longitudinal magnetic field greater than the critical field. ***William B. Ittner.*** *Physical Review*, v. 111, ser. 2, no. 6, Sept. 15, 1958, p. 1483-1487.

1911 Conductivity of Nonpolar Crystals in Strong Electric Field. II. The distribution function of the "hot electron" is investigated in germanium for the case of a small applied electric field, where both acoustical- and optical-mode scattering exists. ***Jiro Yamashita.*** *Physical Review*, v. 111, ser. 2, no. 6, Sept. 15, 1958, p. 1529-1532.

1912 A Quadratic Photoelectromagnetic Effect in Germanium. The quadratic photoelectromagnetic (P.E.M.) effect observed by Kikoin and Noskov in cuprite has been observed in germanium and silicon. The effect occurs when the magnetic field B is rotated an angle ϕ about an axis lying in the illuminated face and perpendicular to the primitive direction of B. ***Manuel Cardona and William Paul.*** *Physics and Chemistry of Solids*, v. 7, nos. 2/3, Nov. 1958, p. 127-140.

1913 The Electrical Resistivity and Superconductivity of Some Uranium Alloys and Compounds. The electrical resistivity and superconductivity of a series of α (orthorhombic) and quenched γ (body-centered cubic) binary alloys of U with Nb and Mo were investigated at temperatures down to 1 K. Anomalous resistivity behavior occurs in both types of structure.

Ten intermetallic compounds of U were also tested for superconductivity down to about 1 K. Four new superconductors were discovered: UCo (1.70 K), U_6Mn (2.32 K), U_6Fe (3.86 K) and U_6Co (2.29 K). The last three compounds are isomorphous and include the first superconducting compounds of Mn and Fe. ***B. S. Chandrasekhar and J. K. Hulm.*** *Physics and Chemistry of Solids,* v. 7, nos. 2/3, Nov. 1958, p. 259-267.

1914 Heat Capacity of Dilute Magnesium-Aluminum Alloys Below 4.2 K. Variation of the electronic term with solute concentration suggests that a new overlap across the Brillouin zone is initiated at an electron concentration of about 2.02. The effective mass ratio of these overlap electrons is given approximately by $m^*/m = 0.6$, which figure is in reasonable agreement with theoretical estimates. No abrupt change of the Debye temperature with solute concentration is observed. ***John Rayne.*** *Physics and Chemistry of Solids,* v. 7, nos. 2/3, Nov. 1958, p. 268-274.

1915 Cadmium Embrittlement of High Strength Steels at Elevated Temperatures. Collection of data to determine why cadmium coated steels failed in service at 700 F and higher. ***Bennie Cohen.*** *Plating,* v. 45, Nov. 1958, p. 1127-1132.

1916 Electrical Resistance Effects Associated With the Allotropic Transformation in High Purity Iron. The results were too uncertain to deduce the mechanism of the transformation. In the transformation from alpha to beta, a sharp decrease (about 1.3%) in resistance is observed; however, in the reverse direction, no sharp increase in resistance is noted and a permanent decrease is experienced in each cycle. ***K. Shimura, E. Eichen, and J. W. Spretnak.*** *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 57-738, Jan. 1, 1958, 64 pp. (TL507 Un3.18w Contin.)

1917 Research on Ferrous Materials Fatigue. Three studies of the effect of fatigue stressing on steel were made,—(1) the rate of propagation of fatigue cracks, (2) the effect of surface hardening by shot peening and plating, by carburizing, and by nitriding, and (3) the transverse properties of SAE 4340 steel. An equation is proposed expressing fatigue crack length as a function of fatigue life. ***Harold N. Cummings, Foster B. Stulen, and William S. Schulte.*** *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 58-43, Aug. 1958, 104 pp. (TL507 Un3.18w Vis.)

1918 On Stress Interaction in Fatigue and a Cumulative Damage Rule. I. 2024 Aluminum and SAE 4340 Steel Alloys. Determination of the effects of stress-interaction under randomly varied exponentially distributed stress amplitudes representing gust and maneuver loads on aircraft wings. A quasi-linear cumulative damage theory supported by numerous test results is developed. The lack of significance of the conventional endurance limit under random loading is demonstrated. ***Alfred M. Freudenthal and Robert A. Heller.*** *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 58-69, June 1958, 48 pp. (TL507 Un3.18w Vis.)

1919 Various Aspects of the Distribution of Fatigue Lives. The report deals with the asymptotic probability function of limited smallest values that is being used for the representation and interpretation of both constant stress-amplitude and random fatigue tests and for the estimate of the minimum fatigue life. ***E. J. Gumbel.*** *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 58-72, July 1958, 40 pp. (TL507 Un3.18w Vis.)

1920 Methods of Determining Surface Roughness. Twelve techniques for investigating the microscopic surface roughness of continuous surfaces are cited as background. Of these, measurements of polarization capacitance made in aqueous electrolyte solutions were reproducible. Experimentation was begun to establish a radioactive method for measuring surface roughness. ***M. K. Testerman.*** *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 58-230, June 1958, 42 pp. (TL507 Un3.18w Vis.)

1921 Brittle-Ductile Transition in Vanadium. The effect of small amounts of metallic and non-metallic additions. Physical properties of vanadium have been determined through the transition temperature. ***Benny A. Loomis and O. N. Carlson.*** *U. S. Atomic Energy Commission, ISC*-1037, Mar. 1958, 99 pp. (UF767 Un3.1is Contin.)

1922 The Effect of Simulated Weld Thermal Cycles on the Properties of Hastelloy B. Reduction-in-area, load, and strain measurements were taken and the results correlated with microstructural changes in the weld heat-affected zone during cycling in the range 1500 to 2400 F. ***Ernest G. Thompson.*** *U. S. Atomic Energy Commission, ORNL*-2582, Oct. 30, 1958, 65 pp. (UF767 U3o Contin.)

1923 Elevated Temperature Properties of 2024-T3 Aluminum Alloy. The data given represent only typical properties of the material when tested under the noted test conditions of temperature, time at temperature, and strain rate. ***Donald R. Adolphson.*** *U. S. Atomic Energy Commission, SCTM*-298-58(16), Sept. 16, 1958, 22 pp. (UF767 Un3.1sct Contin.)

1924 Elevated Temperature Properties of 7075-T6 Aluminum Alloy. Included are mechanical and thermal data. Besides the variable of temperature, the effects of time at temperature, rate of loading, and rate of heating are included. ***Donald R. Adolphson.*** *U. S. Atomic Energy Commission, SCTM*-299-58(16), Sept. 16, 1958, 23 pp. (UF767 Un3.1sct Contin.)

1925 Elevated Temperature Properties of 2014-T6 Aluminum Alloy. Included are mechanical and thermal data. Besides the variable of temperature, the effects of time at temperature, rate of loading, and rate of heating are included. ***Donald R. Adolphson.*** *U. S. Atomic Energy Commission, SCTM*-300-58(16), Sept. 16, 1958, 22 pp. (UF767 Un3.1sct Contin.)

1926 Cumulative Fatigue Damage at Elevated Temperature. A study was conducted using heat-treated SAE 4130 alloy steel. The S-N curves at room temperature, 400 F, and 800 F were obtained from rotating-beam fatigue tests. The results are compared with those of a theoretical analysis. ***William K. Rey.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4284, Sept. 1958, 53 pp. (TL570 Un3t Vis.)

1927 A Phenomenological Theory for the Transient Creep of Metals at Elevated Temperratures. The transient creep is closely connected with the subsequent steady creep, and the apparent exponent of the time in the transient region is permitted wide variations between 0 and 1. From this theory it is possible to contruct nondimensional creep curves which extend continuously from the transient region into the steady-state region. ***Elbridge Z. Stowell.*** *U. S. National Advisory Committee for Aeronautics, Technical Note* 4396, Sept. 1958, 31 pp. (TL570 Un3t Vis.)

1928 The Determination of Initial Stresses in Steel Plates. A non-destructive method for the determination of the direction and magnitude of the principal stresses at any location in a structure. Method consists of attaching electric-wire strain gages around the point at which the stress is to be measured and then drilling a hole (1⅛ in. to 1 in. diameter) at that point. The gage reading before and after the drilling of the hole are used to determine the stress. ***C. Riparbelli, E. W. Suppiger, and E. R. Ward.*** *U. S. Ship Structure Committee, SSC*-42, 48 pp. (VM1 Un3.7s Contin.)

1929* Some Physical Properties of Superstructures With Shifts. Investigation to determine whether there is a difference in physical properties for superstructures with and without shifts. In the systems Cu_3Au-Zn_3Au,Pd_3Cu, and CuAu-Zn, electric resistivity and Young's modulus are higher and the Hall constant more negative for a superstructure with shifts than for non-disturbed order. (*In German.*) Einige physikalische Eigenschaften von Überstrukturen mit Verwerfungen. ***Werner Köster and Walter Lang.*** *Zeitschrift für Metallkunde,* v. 49, Sept. 1958, p. 443-449.

1930* The Reformation and New Formation of the Omega Structure in Titanium-Vanadium and Titanium-Molybdenum Alloys. Measuring the change in hardness, dilatation and susceptibility as well as X-ray and metallographic methods. TTT-diagrams are given for the alloys TiMo 14 and TiMo 16. Similar investigations were performed with two titanium-vanadium alloys. The results are interpreted on the basis of the theory of nucleation. (*In German.*) Rückbildung und Neubildung der Omega-Struktur in Titan-Vanadin- und Titan-Molybdän-Legierungen. ***Karl Löhberg and Herbert Westphal.*** *Zeitschrift für Metallkunde,* v. 49, Sept. 1958, p. 449-455.

1931* Magnetic Properties and Order Structure of Nickel-Manganese Alloys. II. Changes of Properties in Single Crystal Due to Plastic Deformation. The plastic behavior of ordered and disordered single crystals is generally comparable with the behavior of other face-centered cubic alloys. (*In German.*) Magnetische Eigenschaften und Ordnungsstruktur von Nickel-Mangan-Legierungen. II. Eigenschaftsänderungen in Einkristallen infolge plastischer Verformung. ***Rolf Hahn and Eckart Kneller.*** *Zeitschrift für Metallkunde*, v. 49, Sept. 1958, p. 480-488.

1932* Elastic Anisotropy of Transformer Sheets With "Goss" Texture and Cube Layer. Young's modulus of transformer sheets with different textures was measured along different directions with respect to the direction of rolling. In the case where (100)-planes are parallel to the plane of rolling, a maximum was found near the bisector of the angle between the transverse direction and the direction of rolling, in accordance with theoretical predictions. The "Goss-texture" gives rise to a maximum at an angle of about 30° against the transverse direction (the theoretical value is 35° 16'). (*In German.*) Elastische Anisotropie von Transformatorenblech mit Goss-Textur und Würfellage. ***Ferdinand Stangler.*** *Zeitschrift für Metallkunde*, v. 49, Sept. 1958, p. 489-490.

See also: **1455** (surface tension of systems Hg-Cd-Cs and Hg-Cd-K); **1788** (properties of four irons and 20 steels); **1789** (properties, available forms, and applications of nonferrous metals); **1993** (magnetostriction of Al-Fe alloys); **2332** (properties of Al–5% Mg alloy); **2333** (strength of Al-Mg alloy); **2370** (strength of brazed joints); **2388** (strength of spot welds).

METALS—MECHANICAL WORKING

1933 Automatic Profile-Milling. New Machine for Two-Dimensional 360-deg. Contour Machining. A very wide range of two-dimensional contour-machining can be done on the simple, vertical profiling-machine. In a new version of this type of machine, automatic template-following at constant speed and with constant pressure greatly increases the scope of the machine and reduces machining times. *Aircraft Production*, v. 20, Nov. 1958, p. 416-419.

1934 Rotodyne Rotor-Blade. I. Heat-Treatment and Machining Operations on the Main Spar. The Rotodyne rotor-blade is a remarkable component of a unique aircraft. The blade is made almost entirely of high-tensile steel and, particularly in the prototype quantities so far made, has presented some difficult problems in manufacture. *Aircraft Production*, v. 20, Nov. 1958, p. 437-442.

1935 Chrysler Machines With Job-Tested Oxides. A dozen jobs have been converted to ceramics and new ones are added at the rate of one a month at Chrysler's Indianapolis plant. Some cutting speeds have been doubled or more. Tests and current experience show that the high cutting speeds possible with oxides are not necessarily always the most economical. But major economies have resulted from increased tool life, particularly because shutdowns for tool adjustment and replacement have been sharply reduced. ***Ben C. Brosheer.*** *American Machinist*, v. 102, Nov. 3, 1958, p. 108-113.

1936* Elongation and Spread During Hot Rolling of Low Carbon Steels With Great Draughts. Experiments in hot rolling steels under high draughts of from 50 up to 90%. The tests were performed on rather a large scale and simultaneously a series of parameters were measured, including elongation, spread, forward slip, velocity of rolling, pressure, and torque of rolling. Metallographic investigations were also carried out. (*In Polish.*) Wydłużenie i rozszerzenie przy walcowaniu na gorąco dużymi gniotami miękkiej stali. ***Zygmunt Wusatowski and Bronisław Hoderny.*** *Archiwum Hutnictwa*, v. 3, no. 3, 1958, p. 161-179 + 1 plate.

1937* The Forward Slip and the No Slip Angle During Rolling Low Carbon Steels With Great Draughts. Relationships are derived between forward slip, rolling velocity, and the position of the no slip angle. (*In Polish.*) Wyprzedzanie i kąt płaszczyzny podziałowej przy walcowaniu dużymi gniotami miękkiej stali. ***Zygmunt Wusatowski and Franciszek Kunert.*** *Archiwum Hutnictwa*, v. 3, no. 3, 1958, p. 181-199.

1938 High Explosives Shape Airplane Fuel Tanks. North American engineers developed use of explosive forming to make wing-tip fuel tanks for the Navy T2J jet trainer. The tank, made up of two sections, is about 12 ft. long. *Automotive Industries*, v. 19, no. 10, Nov. 15, 1958, p. 41.

1939 Automating Crankshafts and Cold-Extruding Piston Pins. The M-E-L Division, Ford Motor Co. packs an enormous amount of equipment and process in one-million square feet of floor space. Covers two interesting components—crankshafts and piston pins—and some highlights on cylinder block and piston quality control. ***Joseph Geschelin.*** *Automotive Industries*, v. 119, no. 10, Nov. 15, 1958, p. 48-51.

1940 Power Steering Gear Housing Machined in One Cycle. The malleable iron gear housing for the 1959 power steering gear manufactured by Saginaw Steering Gear Div., GMC, is machined completely in one cycle in a huge Greenlee transfer machine. *Automotive Industries*, v. 119, no. 10, Nov. 15, 1958, p. 66 + 2 pages.

1941 Effect of Technological Factors on the Depth of Strain Hardening in Grinding. Describes the results of a study of the layers in annealed U8 steel underneath the ground surface. These layers were investigated by successive electrochemical removal. The degree of strain hardening of the layer was determined by microhardness measurements. At the same time, distortions of the crystal lattice were investigated by X-ray analysis. ***Yu. S. Terminasov and A. G. Yakhontov.*** *Henry Brutcher Translation No.* 4223, 5 pp. (From *Metallovedenie i Obrabotka Metallov*, no. 5, May 1958, p. 40-43.) Henry Brutcher, Altadena, Calif.

1942* Future Automatic Plant: 5 Requirements. Examples of automatic assembly point to future economies. *Canadian Metalworking*, v. 21, Oct. 1958, p. 28 + 2 plates.

1943 Machinability Ratings Are Misleading, Unless—. A new approach to the concept of machinability is needed. Present machinability ratings do not specify tool life; yet this factor is all-important in the determination of "optimum" cutting speed (that sfpm rate which will produce maximum production at minimum cost). Edge life should be restricted to something that approaches the optimum time. ***Horace Frommelt.*** *Carbide Engineering*, v. 10, Nov. 1958, p. 9-12.

1944 Diamond Wheel Markings—Secret of Successful Carbide Grinding. The standard wheel marking has seven positions: abrasive type, grit size, grade, concentration, bond type, bond modification, and diamond depth. Each position is dependent on the others; a change in any one position will influence the performance of the diamond wheel. The meaning of the various markings is explained. ***Howard F. McGlory.*** *Carbide Engineering*, v. 10, Nov. 1958, p. 13-17.

1945 Titanium Advances in Crusader III Design. Improved spotwelding, forming, and tooling techniques being used in production of new aircraft. ***C. P. Smith.*** *Light Metal Age*, v. 16, Oct. 1958, p. 6-7.

1946 Magnesium. New autoclaving method used to form aircraft skin. *Light Metal Age*, v. 16, Oct. 1958, p. 16.

1947 Glossary of Terms Used in the Aluminum Extrusion Industry. *Light Metal Age*, v. 16, Oct. 1958, p. 17-24.

1948* Machinability or Cutting Fluid Evaluation by Drilling Torque Test. A laboratory power feed drill press was used to determine the machinability of two new, high-strength stainless steels. As a result of these studies, a technique for evaluating cutting fluids has been developed which yields an optimum tool life rating as well as relative cutting efficiency. Drill press tool life data produced curves that are very similar to those determined from lathe tool life data as expressed by the Taylor equation ($Vt^n = C$). A simplified test method for shop use is provided. ***R. D. Clouse and E. R. Hall.*** *Lubrication Engineering*, v. 14, Nov. 1958, p. 483-487.

1949* **Gun Drilling.** Methods for speed and accuracy in drilling deep holes. ***Claude E. Sonday and Darrell Ward.*** *Machine and Tool Blue Book*, v. 53, Oct. 1958, p. 112 + 10 pages.

1950* **Ceramic Milling of Ferrous Materials.** Cutting-tool vibrations are dampened by using a sintered powder-metal holder in which the cutting tip is locked mechanically by a Cu infiltration technique. Successful runs are being made with ceramics or a combination of ceramics and metallics at 15,000 sfm and with power available up to 150 h.p. The holder consists of a sintered Fe powder briquet containing a slot. After placing the cutting tip in the slot, the briquet is impregnated with Cu and resintered, thus locking the cutting element in the briquet. ***Horace Frommelt.*** *Machine and Tool Blue Book*, v. 53, Nov. 1958, p. 83-90.

1951 Three New Ways to Make Precision Forgings, Extrusions. Equipment, methods, and costs for rotary forging, precision forging of gears, and cross extrusion. ***John F. Murphy.*** *Materials in Design Engineering*, v. 48, Nov. 1958, p. 105-107.

1952 Forming Metals at High Velocities. Surveys methods of "high-energy-rate" and "explosive" forming. Because of low die and equipment costs, the methods are particularly valuable for parts needed in limited quantities. Other advantages are elimination of springback and ability to handle extremely large parts. ***T. C. DuMond.*** *Metal Progress*, v. 74, no. 5, Nov. 1958, p. 68-76.

1953* **Can Ceramic Tools Be Substituted for Hard Alloys?** A review of development, manufacture, and properties of ceramic tools. Hardness, bending strength, and cutting speed relationships. Comparisons of various cutting tool materials. (*In German.*) Kann die Schneidkeramik das Hartmetall ersetzen? ***F. Kolbl.*** *Planseeberichte für Pulvermetallurgie*, v. 6, no. 2, Aug. 1958, p. 48-66.

1954 Explosive Forming Breaks Fabrication Bottleneck. Describes Aerojet's Aeroform process, successfully used on parts up to 34 in. in diameter and even on very brittle metals. ***Irwin Stambler.*** *Space/Aeronautics*, v. 30, no. 5, Nov. 1958, p. 50 + 4 pages.

1955* **The Work of Planning the Design of a Heavy Plate Rolling Mill.** Design factors and construction details for 4.2 m. mill. (*In German.*) Planungsarbeiten für die bauliche Gestaltung eines Grobblech-Walzwerkes. ***Wilhelm Hilterhaus.*** *Stahl und Eisen*, v. 78, no. 22, Oct. 30, 1958, p. 1525-1536.

1956* **New Continuous Small Section Rolling Mill Train for a Large Rolling Program.** Equipment and operation of fully-continuous mill. (*In German.*) Neue vollkontinuierliche Feinstrasse für ein umfangreiches Walzprogramm. ***Nikolaus Petrovits and Hanns-Heinz Billen.*** *Stahl und Eisen*, v. 78, no. 22, Oct. 30, 1958, p. 1546-1556.

1957* **Determination by Experiment and by Calculation of the Roll Force and Torque Under the Simultaneous Effect of Strip Tension Stresses.** (*In German.*) Versuchsmässige und rechnerische Bestimmung von Walzkraft und Drehmoment bei gleichzeitiger Einwirkung von Bandzugspannungen. ***Hans-Günter Müller and Paul Funke.*** *Stahl und Eisen*, v. 78, no. 22, Oct. 30, 1958, p. 1564-1574.

1958* **The Use of an Irremovable Mandrel in the Piercing Unit of a Tube Rolling Mill.** The use of long lasting mandrels with internal water cooling in the first piercing unit of 400 mm tube rolling mill at the Transcaucasian Iron and Steel Works has given very effective results. Arrangements are being made for application of the irremovable mandrels in the second piercing unit of the mill. (*In Russian.*) Primenenie nesmeniaemoĭ opravki na proshivnom stane truboprokatnogo agregata 400. ***A. N. Borovkov and E. A. Svtelitskii.*** *Stal'*, v. 18, no. 10, Oct. 1958, p. 926-927.

1959 Hot-Cold Forming Boosts Quality, Prunes Costs. Less starting material is needed; lower carbon steel can be used; tempering and quenching are eliminated; machining steps are reduced. *Steel*, v. 143, Nov. 3, 1958, p. 72-74.

1960 How to Forge Molybdenum. With a few exceptions, it can be forged like steel. *Steel*, v. 143, Nov. 3, 1958, p. 84-86.

1961 Airless Plant Aids Space Conquest. A complete fabrication plant sealed within a building and filled with argon gas, the IN-FAB facility will process refractory metals for missile nose cones, rocket and jet engines of the future, and space vehicles. *Steel*, v. 143, Nov. 17, 1958, p. 63.

1962 Cutting Fluid Ups Machining Efficiency. Soluble, heavy duty oil doubled milling machine tool life. It's more economical than other types, is used in less concentrated form, has longer life. *Steel*, v. 143, Nov. 17, 1958, p. 113.

1963 Hot Roll Forms Titanium. Successful use of heated dies in forming the material led Boeing engineers to try red hot rolls. They built a furnace around each station in a Yoder machine. *Steel*, v. 143, Nov. 17, 1958, p. 114.

1964 How to Get More From High Strength Steel. Experience of aircraft firm shows that substandard performance often can be traced to four problem areas: rolling or forging, machining, heat treatment, and finishes. *Steel*, v. 143, Nov. 17, 1958, p. 128-129.

1965* **Economical Shapes of Cutting Tools.** Some suggestions for selection of proper shape and size of tips, their position and method of fastening in tool holders, and suitable shapes of tool holders. By following these suggestions, savings on tip materials and grinding disks, shortening of grinding time, and decrease of possibilities of cracking can be achieved. (*In Czech.*) Úsporné tvary nožů ***O. Kytner.*** *Strojírenská Výroba*, v. 6, no. 9, Sept. 1958, p. 385-388.

1966* **Ultrahigh-Speed Machining. Panacea or Pipedream?** Ultra-high speed machining is not the solution to the problem of economical removal of metal from hard alloys. Even at very high speeds, the life of carbide tools is quite short. ***A. O. Schmidt.*** *Tool Engineer*, v. 41, no. 5, Nov. 1958, p. 105-109.

1967* **Improving Punchability of Silicon Steel.** Punchability of 3¼% Si steel can be improved even in the heat-treated grain-oriented condition if scale is removed before punching or treatment is such as to obviate scale. The punchability rating for a given material is a function of both the material properties and the punching practice. ***C. S. Wukusick and R. S. Zeno.*** *Tool Engineer*, v. 41, no. 6, Dec. 1958, p. 63-70.

1968* **Surface Finishes. Carbide vs. Oxide.** For precision or light machining and long tool life, oxides are usually tops. For uniform finish, turn to carbides, machineability tests show. ***Leonard A. Sowinski.*** *Tooling & Production*, v. 24, no. 8, Nov. 1958, p. 53-56.

1969* **Mechanized Assembly of Transistors.** ***Richard C. Shafer.*** *Tooling & Production*, v. 24, no. 8, Nov. 1958, p. 59-62.

1970* **Parts From the Solid, by Small (or no) Chip Methods.** Sleeves and spools for hydraulic servo valves are prepared by grinding with able assistance from electrical discharge and ultrasonic machining methods. *Tooling & Production*, v. 24, no. 8, Nov. 1958, p. 67-68.

1971 Shape Changes of Internal Surfaces in Extrusion. Presents two semi-empirical methods for determining shape changes of internal surfaces during extrusion. In each method, a grid is scribed on a meridian (axial) plane to delineate the course of deformation. In the "grid-coordinate" method, the changes in grid shape are directly utilized to determine the internal deformation. The "particle-velocity" method reveals the deformation from analysis of the flow paths and velocity variations of the grid intersections during extrusion. An experimental example of the latter method is presented. ***W. B. Nowak and E. J. Rapperport.*** U. S. *Atomic Energy Commission, NMI*-1200, Mar. 21, 1958, 16 pp. (UF767 Un3.1nm Contin.)

1972* **Some Technological Problems of Pressure Hot-Working of Heat Resistant Alloys.** Recrystallization of heat resistant alloys. Basic conditions assuring high plasticity of heat resistant alloys and other materials too brittle for usual methods of deformation. Study of the combined effect of structure and type of stressed state on plasticity of heat resistant alloys.

Development of new methods of deformation of heat resistant alloys and checking these methods in production. (*In Russian.*) Nekotorye voprosy tekhnologii goriachei obrabotki davleniem zharoprochnykh splavov. ***M. V. Rastegaev.*** *Vestnik Mashinostroeniia*, v. 38, no. 10, Oct. 1958, p. 54-58.

1973* Wear of Carbide Tools and Surface Finish Generated in Finish Turning of Steel. Concentrated tool-wear, localized upon the boundaries of the areas of contact between rake face and chip and between clearance face and workpiece, is a specific phenomenon encountered in turning of steel. It causes the surface finish to deteriorate rapidly, and in addition it can be supposed to be associated with the dimensional accuracy and the condition of surface layer of the workpiece. Therefore it has to be taken into account when considering the operation of fine-finishing turning. ***Vladimir Šolaja.*** *Wear*, v. 2, no. 1, Aug. 1958, p. 40-58.

See also: **1292** (ceramic cutting tools); **1301** (machining BeO); **1836** (welding of Al-killed stainless steel sheets); **2391** (electric welding in wire drawing operations).

METALS—METALLOGRAPHY, TRANSFORMATIONS, AND STRUCTURES

1974 Pseudospirals, Imperfect Structures and Crystal Habit Produced by Field Evaporation of Metal Crystals. Spiral-like structures are frequently observed when the tip of a field emission microscope is subjected to field evaporation at elevated temperature. Close inspection of tips of various metals with the field ion microscope were made. Crystal surfaces, as obtained by low temperature evaporation at slightly lower field strengths, are shown for Pt, Ir, Rh, and W. ***E. W. Müller.*** *Acta Metallurgica*, v. 6, Oct. 1958, p. 620-630.

1975 Solute Hardening of Close-Packed Solid Solutions. The contribution of local order, and of the segregation of solute atoms at extended dislocations, to the strength of close-packed solid solutions are investigated quantitatively. ***P. A. Flinn.*** *Acta Metallurgica*, v. 6, Oct. 1958, p. 631-635.

1976 The Diffusion of Carbon and Oxygen in Vanadium. Carbon diffuses in V at a slightly more rapid rate than O. From internal friction and elastic after-effect measurements, the diffusion coefficients of these interstitial impurities as functions of temperature were found. ***R. W. Powers and Margaret V. Doyle.*** *Acta Metallurgica*, v. 6, Oct. 1958, p. 643-646.

1977 A Study of Lattice Distortion by an X-Ray Diffraction Technique. To study the mosaic structure of crystals, the technique of Lambot et al. was extended in such a way that a point-to-point correspondency was established between specimen and diffraction pattern. The resolution of angle and position are discussed in detail. In addition, the instrumental errors in obtaining the angular range of reflection are discussed. Two instruments were constructed; one was designed for transmission experiments (Laue case) and the other for reflection experiments (Bragg case). ***N. Kato.*** *Acta Metallurgica*, v. 6, Oct. 1958, p. 647-652.

1978 On the Precipitation of Silicon Out of a Supersaturated Aluminum-Silicon Solid Solution. The precipitation of silicon from Al(1% Si) solid solution was followed by resistometric and micrographic methods. Precipitation rates in the temperature range 200-400 C were measured. The possible correspondence between inoculation and quench hardening is discussed. ***H. S. Rosenbaum and D. Turnbull.*** *Acta Metallurgica*, v. 6, Oct. 1958, p. 653-659.

1979* On the Formation of Dislocation Substructure During Growth of a Crystal From Its Melt. Dislocation networks in as-grown lithium fluoride crystals were studied by etch pit and decoration techniques in an attempt to obtain experimental evidence concerning the origin of grown-in dislocations. Several mechanisms for formation of new dislocation loops at or near a growing face were considered. The kinds of distribution observed, and the insensitivity of the grown-in networks to the growth rate and temperature gradient in the solid, were considered to be consistent with the hypothesis that stresses are responsible for most of the grown-in dislocations. ***J. Washburn and J. Nadeau.*** *Acta Metallurgica*, v. 6, Nov. 1958, p. 665-673.

1980 The Role of Dislocations in Carbide Precipitation in α-Iron. The precipitation of carbon in α-iron wires strained to different amounts was followed by means of internal friction measurements. As the amount of strain increased, the rate of precipitation became faster and the shapes of the time-transformation curves gradually changed, although no abrupt transitions in these curves were found. The results agreed with a theory for the diffusion-controlled growth of asymmetric particles, from which the number density of particles was computed. ***R. H. Doremus.*** *Acta Metallurgica*, v. 6, Nov. 1958, p. 674-679.

1981 Martensitic Transformations and Determination of the Inhomogeneous Deformation. A simple graphical method is presented for determining, directly from observations of the crystallographic features of a martensitic transformation, the inhomogeneous deformation which is part of the total transformation distortion. ***D. S. Lieberman.*** *Acta Metallurgica*, v. 6, Nov. 1958, p. 680-693.

1982 Liquid Immiscibility in Copper-Iron and Copper-Cobalt Systems in the Supercooled State. The constitution of both Cu-Fe and Cu-Co alloys in the liquid state was studied by the following two methods: the measurement of magnetic susceptibility at high temperatures, and the microscopic examination of quenched specimens. Since the liquid alloys were supercooled 100 C or more, the investigation could be extended to the metastable region below the liquidus curves. In both systems, the liquid immiscibility has been found only in the supercooled state. The immiscibility gap is nearly symmetrical about the axis corresponding to the equi-atomic composition. ***Y. Nakagawa.*** *Acta Metallurgica*, v. 6, Nov. 1958, p. 704-711.

1983* Metallographic Studies of Metals After Explosive Shock. Samples of Cu and Fe were subjected to plane shock waves of intensities up to 600 kbars. Copper, after shocks of about 200 kbars, shows mechanical twins; Fe develops Neuman bands, and above 130 kbars undergoes a phase transition. ***Cyril Stanley Smith.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society*, v. 122, no. 5, Oct. 1958, p. 574-589.

1984* Layer Growth During Interdiffusion in the Aluminum-Nickel Alloy System. The kinetics of growth of intermediate phase layers was explored in diffusion couples annealed in the temperature range 400 to 625 C for times up to 340 hr. and under pressures up to 5 tsi. ***L. S. Castleman and L. L. Seigle.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society*, v. 212, no. 5, Oct. 1958, p. 589-596.

1985* Effects of Composition on Transformations in Titanium-Chromium Alloys The morphology and mechanism of the proeutectoid α and the eutectoid reactions have been recently investigated in some detail in an iodide-base Ti-7.22% Cr alloy. These studies have now been extended to an iodide-base Ti-10.8% Cr alloy in order to evaluate the effects of composition on the proeutectoid and eutectoid transformations. ***H. I. Aaronson, W. B. Triplett, and G. M. Andes.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society*, v. 212, no. 5, Oct. 1958, p. 624-626.

1986* Self-Diffusion of Silver in Molten Silver. Self-diffusion coefficients were measured by means of the capillary-reservoir method in the temperature range 1002 to 1105 C. The results can be represented by the equation $D = (7.10 \pm 0.06) \times 10^{-4} \exp[(-8150 \pm 1130)/RT]$. The heat of activation agrees within the limit of experimental uncertainty with that for the viscous flow. ***Ling Yang, Satoshi Kado, and G. Derge.*** *American Institute of Mining, Metallurgical and Petroleum Engineers, Transactions, Metallurgical Society*, v. 212, no. 5, Oct. 1958, p. 628-630.

1987* The Temperature Dependence of Preferred Orientation in Rolled Tungsten. The preferred orientation of cold-rolled tungsten was evaluated as a function of annealing

temperature by means of pole figures. Additional information was obtained from back reflection powder patterns and photomicrographs. An analysis of these observations in terms of polygonization, substructure growth, and recrystallization was made. ***J. W. Pugh.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society,* v. 212, no. 5, Oct. 1958, p. 637-642.

1988* The Redistribution of a Second Phase During Annealing in a Temperature Gradient. If a 2-phase alloy is annealed in a temperature gradient, there is a tendency for the piece to be enriched in one phase at the hot or cold end of the piece: e.g., Fe_3C concentrates at the hot end of α-Fe and hydrides enrich at the cold end of α-Zr. The physical forces giving rise to this effect are discussed and, for the case where diffusion occurs predominantly in one phase, equations are given for estimating the kinetics of the redistribution. ***P. G. Shewmon.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society,* v. 212, no. 5, Oct. 1958, p. 642-647.

1989* Eutectic Solidification Structures. In the course of a study of eutectic solidification the colony subgrain structure was observed in the eutectics between Al and Zn, Sn and Zn, and Al and $CuAl_2$. ***H. W. Weart and D. J. Mack.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society,* v. 212, no. 5, Oct. 1958, p. 664-670.

1990* Formation of a Ni-Ge Phase in Molten Lead. Fabrication of semiconductor devices requires the formation of electrical contacts, often involving the use of Pb, Sn, and Pb-Sn solders. In several recent instances when Ge had been bonded to Ni with Pb, a new metallic phase appeared, suspended as a continuous foil wholly contained within the lead matrix. A brief study was made of the characteristics and possible formation mechanisms of this material. ***M. E. Steidlitz.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society,* v. 212, no. 5, Oct. 1958, p. 676-678.

1991* The Growth of Molybdenum, Tungsten, and Columbium Crystals by Floating Zone Melting in Vacuum. A vacuum floating zone apparatus using r.f. heating has been employed to grow single crystals of tungsten, molybdenum, and columbium. A marked improvement in purity is achieved by a single pass run through tungsten and molybdenum. ***E. Buehler.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society,* v. 212, no. 5, Oct. 1958, p. 694-698.

1992* Zirconium and Hafnium Phases Isostructural With Ti_2Ni. The existence of seven Ti_2Ni-type phases containing Zr or Hf is reported, and lattice parameters are given. For some of these phases there is evidence that oxygen is required for stability. ***M. V. Nevitt and L. H. Schwartz.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society,* v. 212, no. 5, Oct. 1958, p. 700-703.

1993* The Effect of the Order-Disorder Reaction on the Magnetic Anisotropy and Magnetostriction of Single Crystals of the Ferromagnetic Aluminum-Iron Alloys. An investigation was made of the effect of the order-disorder reaction on the magnetic anisotropy and magnetostriction of single crystals of the aluminum-iron alloys near the Fe_3Al composition. The variation in magnetostriction with ordering depended on composition; whereas, on disordering, the anisotropy changed toward larger positive values for all compositions. ***R. C. Hall.*** *American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, Metallurgical Society,* v. 212, no. 5, Oct. 1958, p. 703-706.

1994 Recrystallization of Low Carbon Steel During Rapid Induction Heating. A metallographic study of the recrystallization of steel 08 during rapid induction heating and of the effect of various factors (heating rate, final temperature, cooling rate) on the properties of annealed steel. ***B. A. Kuznetsov.*** *Henry Brutcher Translation No.* 4150, 13 pp. (From *Metallovedenie i Obrabotka Metallov,* no. 2, Feb. 1958, p. 28-35.) Henry Brutcher, Altadena, Calif.

1995 Effect of Boron on Austenite Grain Size in Steel. Effects of different amounts of boron and of the preliminary deoxidation of steel by ferrotitanium on austenite grain size produced by heating boron-containing steel. ***L. L. Pyatakova and O. D. Zhizhakina.*** *Henry Brutcher Translation No.* 4220, 10 pp. (From *Metallovedenie i Obrabotka Metallov,* no. 5, May 1958, p. 27-30.) Henry Brutcher, Altadena, Calif.

1996 Sigma Phase in Austenitic Steel EI 448. Study of the effect of sigma phase on the mechanical properties. ***E. I. Uryupina and A. F. Likina.*** *Henry Brutcher Translation No.* 4252, 6 pp. (From *Metallovedenie i Obrabotka Metallov,* no. 6, June 1958, p. 37-41.) Henry Brutcher, Altadena, Calif.

1997 Distribution of Carbon in the Heat-Affected Zones of Welds in Austenitic 18-8 Steel. Autoradiographic study of carbon distribution in heat-affected zone argon-arc welds in austenitic 18-8 steels immediately after welding and after various heat treatments. Correlation of observations with corrosion in fuming and boiling 65% HNO_3. Best heat treatment for avoidance of weld decay or corrosion in service. ***N. V. Ul'yanova and B. V. Sagalovich.*** *Henry Brutcher Translation No.* 4289, 12 pp. (From *Metallovedenie i Obrabotka Metallov,* no. 7, July 1957, p. 2-7.) Henry Brutcher, Altadena, Calif.

1998 Quantitative Metallographic Determination of Alpha Phase in Austenitic Weld Metal. Optimum limits for the percentage of α phase in austenitic welds in welding high temperature steels were established. A method of etching microsections to reveal this phase was been worked out. ***A. D. Kuznetsova-Sadovnikova.*** *Henry Brutcher Translation No.* 4294, 3 pp. (From *Svarochnoe Proizvodstvo,* no. 1, Jan. 1958, p. 34-36.) Henry Brutcher, Altadena, Calif.

1999* Diffusion in Partial Solid Solutions Based on Nickel. Determination of diffusion coefficients by means of tracers in the systems Ni-Ti, Ni-Ti-Cr, and Ni-Ti-Cr-W-Al in the temperature range 920 to 1250 C, and determination of activation energy. (*In Russian.*) Diffuziia v organichennykh tverdykh rastvorakh na osnove nikelia. ***A. Ia. Shiniaev.*** *Fizika Metallov i Metallovedenie,* v. 6, no. 3, 1958, p. 450-455.

2000* Microkinetics of Martensite Transformation. Study of formation of separate crystals of martensite, and its relation to changes in stress and deformation. Explains the impulse-wise formation of martensite crystals. (*In Russian.*) Mikrokinetika martensitnogo prevrashcheniia. ***V. N. Arskii.*** *Fizika Metallov i Metallovedenie,* v. 6, no. 3, 1958, p. 496-504.

2001 Direct Study of Eutectic Alloys by Means of Electron Microscopy. Thin films of the tin-lead eutectic were prepared by a new melting method and examined by electron microscopy. ***N. Takahashi and K. Ashinuma.*** *Institute of Metals, Journal,* v. 87, pt. 1, Sept. 1958, p. 19-23.

2002 An X-Ray Survey of Certain Transition-Metal Systems for Sigma Phases. Certain transition-metal systems, each containing an element of the Third Long Period, were surveyed for sigma phases, using X-ray methods. Eight previously unreported sigma phases were found in binary alloys containing osmium or iridium. ***A. G. Knapton.*** *Institute of Metals, Journal,* v. 87, pt. 1, Sept. 1958, p. 28-32.

2003 The Ageing Characteristics of Two Commercial Alloys Based on the Aluminium-Zinc-Magnesium System. A study of the aging characteristics of the commercial alloys 75S and D.T.D. 687 which have compositions based on the Al-Zn-Mg system. Hardness/aging-time curves were determined, in the range 20-200 C and compared with those for a pure ternary alloy with similar Zn and Mg contents. The effect of prior cold work on the commercial alloys was also studied. ***I. J. Polmear and P. Scott-Young.*** *Institute of Metals, Journal,* v. 87, pt. 3, Nov. 1958, p. 65-70.

2004 The Kinetics and Morphology of the Allotropic Transformation of Cobalt. The orientation relationship between the two phases leads to the conclusion that the cubic phase may be twinned. Observations on twinning due to the $\beta \rightarrow \alpha$ transformation and detwinning during the reverse $\alpha \rightarrow \beta$ transformation throw light on the nucleation conditions in Co. It is shown that inhomogeneous stresses are chiefly responsible for the initiation of the transformation. ***Hervé Bibring, François Sebilleau and Charlotte Bückle.*** *Institute of Metals, Journal,* v. 87, pt. 3, Nov. 1958, p. 71-76.

2005 Solid Solutions of Mercury in Sliver and Gold. A diffusion technique suitable for preparing alloys containing highly volatile solutes was used to obtain a new lattice-parameter/composition curve for the solid solution of Hg in Au. In the Ag-Hg system, certain previous results on lattice parameters were largely confirmed, and hence shown to be preferable to the conflicting results of various other workers. ***H. W. Rayson and L. D. Calvert.*** *Institute of Metals, Journal*, v. 87, pt. 3, Nov. 1958, p. 88-90.

2006 The Solid Solutions of Gallium in Lead. Microexamination of quenched specimens has shown that the solid-solubility limit of Ga in Pb rises from 0.02 wt.-% (0.06 at.-%) at 110 C to 0.17 wt.-% (0.5 at.-%) at the eutectic temperature. The eutectic composition and temperature were found to be 1.4 wt-% (4.2 at.-%) and 311 ± 1 C respectively ***J. Neill Greenwood.*** *Institute of Metals, Journal*, v. 87, pt. 3, Nov. 1958, p. 91-93.

2007 The Uranium-Thorium System and Some Aspects of the Uranium-Thorium-Zirconium System. A simple eutectic system is formed, with a region of liquid immiscibility extending from 6 to 49 at.-% Th. The solubility of Th in U is 0.30 at.-% at 900 C and $<$ 0.05 at.-% at 700 C. Solubility of U in Th is also temperature-dependent, with limits of 0.15, 1.9, and 2.55 at.-% at 800, 1100, and 1325 C respectively. ***J. R. Murray.*** *Institute of Metals, Journal*, v. 87, pt. 3, Nov. 1958, p. 94-96.

2008* Improvement of Ingot Structure by Vibration of Crystallizing Steel. Vibration makes the center part of killed steel ingot more dense, sharply reduces grain size and eliminates the crystal inhomogeneity across the ingot. Description of a vibration unit, and experimental results. (*In Russian.*) Uluchshenie struktury slitka pri vibratsii kristallizuiushcheĭsia stali. ***A. A. Romanov and P. V. Umrikhin.*** *Izvestiia Vysshikh Uchebnykh Zavedenii, Chernaia Metallurgiia*, 1958, no. 7, July p. 37-43 + 2 plates.

2009* Austenite Grain Size in Steels Alloyed With Small Quantities of Boron. At temperatures generally used in heat treatment the presence of B delays grain growth. (*In Russian.*) K voprosu o velichine zerna austenita v stali, legirovannoĭ malymi kolichestvami bora. ***S. M. Vinarov.*** *Izvestiia Vysshikh Uchebnykh Zavedenii, Chernaia Metallurgiia*, 1958, no. 7, July, p. 163-165 + 2 plates.

2010 Producing Martensite by Impact. Sharp blows can produce hard, brittle martensite in hammer heads when edges break off. This martensite, being untempered, is quite brittle and further spalling may occur with little effort. The use of chipped hammers should be discouraged. ***H. O. McIntire and G. K. Manning.*** *Metal Progress*, v. 74, no. 5, Nov. 1958, p. 94-95.

2011* The Mechanism of Diffusion in the Solid State. The account refers to outstanding papers bearing on the topics: the diffusion coefficient, diffusion mechanisms in metals, ionic crystals, and covalent crystals, and boundary and surface diffusion. ***C. E. Birchenall.*** *Metallurgical Reviews*, v. 3, no. 11, 1958, p. 235-277.

2012 Ternary Carbides of Transition Metals With Aluminum and Magnesium. In the ternary systems Mn-Al-C, Co-Al-C, Ni-Al-C, and Co-Mg-C, double carbides were found in which the metal atoms occupy the points of a face-centered cubic lattice with a superstructure. Together with two known compounds they form a separate group of carbides. ***L. J. Huetter and H. H. Stadelmaier.*** *North Carolina State College, Department of Engineering Research, Bulletin No.* 55, July 1958, p. 367-370. (TA21 N81b Vis.)

2013 The Orientation Dependence of Cyclic Work-Hardening in Aluminium Crystals. *P. Charsley and N. Thompson.* *Philosophical Magazine*, v. 3, ser. 8, Oct. 1958, p. 1098-1104 + 1 plate.

2014 The Climb of a Dislocation in a Twisted Whisker. Gomer's observation that twisted mercury whiskers have periodic imperfections separated by distances closely related to the pitch of the twist is explained by considering a dislocation which is approximately parallel to, but displaced from, the axis of the whisker. This dislocation is straight in cartesian coordinates, but helical in the coordinates provided by the crystal lattice. ***F. R. N. Nabarro and P. J. Jackson.*** *Philosophical Magazine*, v. 3, ser. 8, Oct. 1958, p. 1105-1109.

2015 The Occurrence of Stacking Faults in Metallic Systems. A possible qualitative interpretation of the occurrence of stacking faults in metals and alloys is outlined, using an extension of the ideas of Altmann, Coulson, and Hume-Rothery. The metals Co, Sc, and Ti, the ϵ-phase in Fe, Mn, and the α-solid solutions of various B sub-group elements in the noble metals are treated as examples. The effect of temperature on hybrids is briefly discussed. ***J. Spreadborough.*** *Philosophical Magazine*, v. 3, ser. 8, Oct. 1958, p. 1167-1173.

2016 The Crystal Structure and Properties of the Group VB to VIIB Elements and of Compounds Formed Between Them. Crystal structures of these elements and of compounds formed between them are discussed on the basis of the valence-bond theory. A consistent bond scheme is proposed and applied to derive qualitative band structures for these materials. Semiconducting properties are predicted for a series of ternary compounds. ***E. Mooser and W. B. Pearson.*** *Physics and Chemistry of Solids*, v. 7, no. 1, Oct. 1958, p. 65-77.

2017 Theoretical Calculation of Distribution Coefficients of Impurities in Germanium and Silicon, Heats of Solid Solution. The distribution coefficients of Groups III, IV and V impurities in Ge and Si were calculated, and satisfactory agreement with experimental values was obtained. The method of calculation consisted in estimating the change in energy involved in transferring the impurity atoms from a crystalline reservoir to the solid and molten host material respectively. The binding energy of an impurity in the host lattice and the strain energy which it introduces were estimated. The change in vibrational entropy is believed to be negligible. ***Kurt Weiser.*** *Physics and Chemistry of Solids*, v. 7, nos. 2/3, Nov. 1958, p. 118-126.

2018 Constitution of the $AgSbSe_2$-$AgSbTe_2$-$AgBiSe_2$-$AgBiTe_2$ System. Complete series of solid solutions with the cubic structure exist in this pseudoquaternary system. The locus of temperatures and compositions for the order-disorder transition was determined. Lattice constants as a function of composition for the cubic phase and thermoelectric-power data for some of the solid solutions are presented. ***J. H. Wernick, S. Geller, and K. E. Benson.*** *Physics and Chemistry of Solids*, v. 7, nos. 2/3, Nov. 1958, p. 240-248.

2019 Thermodynamics of the Au-Pt System. The electronic, lattice, and mixing free energies are separated for the Au-Pt system, and it is shown that the asymmetric segregation in this system can be ascribed to the filling of the d band at about 30% gold. The value of the segregation potential $6R(V_{AA} + V_{BB} - 2V_{AB})/k$ is derived as about 6090 cal/mole. ***R. J. Weiss and K. J. Tauer.*** *Physics and Chemistry of Solids*, v. 7, nos. 2/3, Nov. 1958, p. 249-251.

2020 Dispersion Theory for Electrons in a Random Lattice With Applications to the Electronic Structure of Alloys. In a three dimensional atomic lattice, occupied at random by atoms of more than one kind, a complete set of approximate solutions of the one-electron Schrödinger equation is obtained that have the periodicity of a Bloch wave in the average. Equations are given that permit the calculation of their energies, their average behavior, apart from a phase factor, near an atom of any type, and of a damping parameter for each wave. A correspondence is established between a random A-B lattice and a periodic lattice with a complex, energy dependent, potential. The eigen value problem in this potential, which can be solved with any of the known methods for a periodic potential, yields the dispersion relation of the system. ***J. Korringa.*** *Physics and Chemistry of Solids*, v. 7, nos. 2/3, Nov. 1958, p. 252-258.

2021* Contributions to the Study of the $\gamma \rightarrow \alpha$ Transformation Without Diffusion in Fe-C Alloys. A study of the influence of the period of relative stability of the γ phase upon the isothermal formation without diffusion of the α phase. ***Butu Rotenstein, Sofia Caloghiru, and Teodor Teitel.*** *Revue de Métallurgie (Bucharest)*, v. 3, no. 1, 1958, p. 99-108.

2022* Phase Transformation of the Manganese-Copper-Iron System. Microstructure, electroresistance, and dilatometric studies indicate a two phase mixture $\gamma + \alpha$ Mn with a pre-

dominant α Mn phase. (*In Russian.*) Fazovye prevrashcheniia v sisteme marganets-med'-zhelezo. ***R. I. Agladze, L. I. Topchiashvili, and V. M. Mokhov.*** *Zhurnal Neorganicheskoi Khimii*, v. 3, no. 10, Oct. 1958, p. 2354-2360 + 1 plate.

See also: **1360** (chemical behavior of Zr); **1882** (structure of deformed Al); **1902** (tungsten recrystallization); **1908** (magnetization of Co- and Fe base alloys); **1916** (allotropic transformation in high purity iron); **1926** (fatigue at elevated temperatures); **1927** (transient creep of metals at elevated temperatures); **2360** (Fe-C phase diagram in welding).

METALS—POWDER

2023 Some Principles for Developing Alloys Based on Borides (of High-Melting Metals). The strength and plasticity of alloys based on borides of high-melting metals are determined by the character of interaction of the borides with the alloying elements. In cases where the borides form with the alloying metals relatively low-melting eutectics in comparison with the melting point of the boride base, the strength and plasticity of the alloys increase. ***K. I. Portnoi and G. V. Samsonov.*** *Henry Brutcher Translation No.* 4344, 7 pp. (From *Izvestiya Akad. Nauk, SSSR, Tekh. Nauk*, no. 7, July 1958, p. 140-141.) Henry Brutcher, Altadena, Calif.

2024 A Method of Assessing the Die-Filling Characteristics of Powders. A standardized cup and shoe arrangement is used to test filling density of a number of metal powders. ***J. Oakley.*** *Institute of Metals, Journal*, v. 87, pt. 1, Sept. 1958, p. 26-28.

2025* Investigation of Sintering of Powder Metal Alloys Based on Fe-Ni-Al. Three stages of the sintering process can be distinguished: (1) reduction of oxide, increase in metal contact area, and recrystallization; (2) mutual dissolution, dispersion of the obtained solid solution, and increase in size of specimens; and (3) homogenization of the solid solution, grain growth, and shrinkage of specimens. (*In Russian.*) Issledovanie spekaniia metallokeramichnykh splavov na osnove sistemy Fe-Ni-Al. ***A. B. Al'tman.*** *Fizika Metallov i Metallovedenie*, v. 6, no. 3, 1958, p. 456-465.

2026 Bulk Handling of Metal Powders. Describes equipment manufactured by the Tote System, Beatrice, Nebraska, in use at the Ford Motor Co., Rawsonville, Michigan. Metal powders are stored in steel bins having a capacity of 6000 lb.; while specially designed Tote hoppers hold 3500 lb. each. Operating in conjunction with these units are discharge mechanisms or tilts, conveyors, chutes, automatic weighing scales and other handling equipment; the whole system being an entirely closed one from the time of filling until discharge into process. ***A. E. Williams.*** *Metal Industry*, v. 93, Oct. 24, 1958, p. 349-351.

2027* Obtaining Metallic Powders by Electrolytic Means. The theory of formation of metallic powders through the secondary process of reduction of metallic ions by atomic H is disproven. ***I. Atanasiu and A. Căluşaru.*** *Revue de Métallurgie (Bucharest)*, v. 3, no. 1, 1958, p. 109-120 + 5 plates.

2028 Application of Ultrasonic Vibration to the Compaction of Metal Powders. Six different metallic powders were examined, but most of the compacts were prepared from H-reduced Fe powder. With this readily compacted material, a small but significant increase in as-pressed density was observed when the die was vibrated ultrasonically. Carbonyl Ni, 70-30 brass, and a mixture of 85% WC and 6% Co also indicated increased density. ***J. G. Thomas and J. B. Jones.*** *U. S. Atomic Energy Commission*, NYO-7921, June 1958, 41 pp. (UF767 U3ny Contin.)

2029 Fundamentals of Sintering. III. The influence of the presence of grain boundaries on the rates of sintering of Ni, Cu, and Fe wire-wound compacts was studied. ***A. L. Pranatis, L. S. Castleman, and L. Seigle.*** *U. S. Atomic Energy Commission*, SEP-250, June 30, 1958, 30 pp. (UF767 Un3.1se Contin.)

NONDESTRUCTIVE TESTING AND QUALITY CONTROL

2030* X-Ray Dioscopic Investigation of the Internal Diffusion Mechanism. Study of transfer of substances adsorbed in porous sorbents. The transfer appears as diffusion in the gaseous phase and as migration along the surface; both occur simultaneously and in one direction. To evaluate the part played by each type of transfer, an attempt was made to separate the flows of these phases. (*In Russian.*) Issledovanie makhanizma vnutrenneĭ diffuzii metodom rentgenovskoĭ diaskopii. ***D. P. Timofeev and A. A. Voskresensekii.*** *Akademiia Nauk SSSR, Doklady*, v. 122, no. 3, Sept. 21, 1958, p. 434-436 + 1 plate.

2031 Recommendations for the X-Ray Examination of Fusion Welded Joints in Light Alloys. Recommendations for the radiographic inspection of fusion welded butt joints in Al and Mg alloys for thicknesses from ¾ in. to 4 in. *British Welding Journal*, v. 5, Nov. 1958, p. 489-491.

2032 Sampling Plans for Acceptance Sampling by Variables Using the Range. Presents a set of sampling plans for acceptance sampling for the case of unknown standard deviation to be used when the item quality is expressed on a variable basis and the variation within a lot is estimated with the average range of the sample or by the sum of ranges for one or several subgroups of the sample. ***Lennart Rade.*** *Chalmers Tekniska Högskolas Handlingar*, no. 202, 1958, 34 pp. (T4 C35t Contin.)

2033 Infrared Finds Auto Suspension Leaks. Leaks in automobile air-suspension systems as small as 8×10^{-5} cubic inch per second can be detected in three seconds. Nitrous oxide replaces air for test purposes. A nondispersion infrared analyzer is the sensitive instrument used for production testing. ***Paul G. Balko.*** *Electronics* (Engineering Edition), v. 31, no. 49, Dec. 5, 1958, p. 82-85.

2034 Quality Control of Melting Stock for Investment Founders. The influence of tramp elements and vacuum melting on the quality of castings produced. In several other spheres of foundry practice, these same problems are being examined and thus the findings have wide implications. ***L. S. Taylor.*** *Foundry Trade Journal*, v. 105, Oct. 16, 1958, p. 467-470.

2035 X-Rays Speed Alloy Check. Time for batch analysis has been reduced from days to a few minutes as control unit compares samples against standards. *Steel*, v. 143, Nov. 24, 1958, p. 114.

2036* Successful Quality-Control Operations. Enumerates elements essential to economical quality control and points out pitfalls to avoid. ***Edward S. Marks.*** *Tool Engineer*, v. 41, no. 6, Dec. 1958, p. 39-42.

NUCLEAR PHYSICS, NUCLEONICS, AND RADIATION

2037* On the Possible Existence of a Second Neutral π-Meson. Consideration on the hypothesis of two-component π^0-meson. (*In Russian.*) O vozmozhnom sushchestvovanii vtorogo neĭtral'nogo π-mezona. ***A. Baldwin and P. Kabir.*** *Akademiia Nauk SSSR, Doklady*, v. 122, no. 3, Sept. 21, 1958, p. 361-364.

2038* Fission Asymmetry. A simplified treatment of the droplet model. To bring the common fissionable nuclei to the region of the "saddle" in the energy surface, it is necessary to have deformations very far from the spherical shape. The droplet model alone does not provide an adequate explanation of the asymmetry of low-energy fission. ***D. R. Inglis.*** *Annals of Physics*, v. 5, Oct. 1958, p. 106-140.

2039* Collective Rotations in Nuclei. A systematic approach is made to the problem of determining the parameters of collective motion in nuclei. Formulas are given for the moment of inertia of the rotational energy and for the collective g-factor of the magnetic moment. The essential elements of a usable model are briefly discussed. ***Felix Villars.*** *Annals of Physics*, v. 5, Nov. 1958, p. 224-242.

2040* On the Decay of Bi^{204}. Energy levels in Pb^{204} have been studied in the electron capture decay of 12 h Bi^{204}. Forty-five transitions and, in addition, about 20 weak, unassigned conversion lines were found in this very complex decay. ***R. Stockendal, T. Novakov, B. Johansson, and M. Schmorak.*** *Arkiv för Fysik*, v. 14, no. 1, 1958, p. 65-84.

2041* Thermal Stress in a Long Cylindrical Fuel Element Without Canning During Heating. Thermal stress distribution in a long cylindrical fuel element wthout canning is calculated during heating up. Maximum stresses appear in steady state at surface of fuel element, where σ_B (R) = σ_Z (R) and both of them are tensile stresses. The last two conditions are fulfilled also in nonsteady state of temperature distribution. (*In German.*) Wärmespannungen in einem nicht umhüllten, zylindrischen Brennstoffelement grosser Länge während der Aufheizung. ***W. Kattwinkel.*** *Atomkernergie*, v. 3, Oct. 1958, p. 394-396.

2042* The Giant Resonance of Photodisintegration of Tantalum. The neutron yield from tantalum has been measured as a function of bremsstrahlung energy, and from the shape of the cross section for the nuclear absorption of photons by Ta has been deduced. This cross section shows definite evidence that it is made up of two component parts. ***B. M. Spicer, H. H. Thies, J. E. Baglin, and F. R. Allum.*** *Australian Journal of Physics*, v. 2, no. 3, Sept. 1958, p. 298-309.

2043 Boiling Water Reactors. General principles; BORAX tests; design of reactor systems; the EBWR, VBWR, ALPR, and other reactors; current and future research and development programs. ***Andrew W. Kramer.*** Addison-Wesley Publishing Co., Reading, Mass. (TK9203.B6 K86b)

2044* Polyphenyls for Heavy-Water Reactors. CGE designing organic cooled reactor aimed at reducing fuel and heavy water inventory and lessening the rigorous metallurgical requirements for the system. *Canadian Chemical Processing*, v. 42, Oct. 1958, p. 50 + 4 pages.

2045* Chemical Engineering for a Pressurised-Water Nuclear Reactor. Tells how the problems of corrosion, radioactivity, fuel element failure, explosion hazards, and waste disposal were tackled for the Shippingport reactor. ***F. R. Paulsen.*** *Chemical & Process Engineering*, v. 39, Nov. 1958, p. 393-395.

2046* The Nomenclature of Particles. A new nomenclature containing the essential notions of the "fusion" theory, stating any particle of a spin differing of ½ (in h unit) is formed by some sort of fusion of several units of spin ½. (*In French.*) Sur la nomenclature des particules. ***Louis de Broglie.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 247, no. 15, Oct. 13, 1958, p. 1069-1072.

2047* Experimental Investigations Concerning the Controlled Nuclear Fusion Problem. Theoretical bases, possibilities to produce fusion processes, fully ionized plasma, average collision time and free path lengths, energy losses, pinch effect and pinch-instability, gamma radiation emission, effect of impurities, duration of the neutron impulse. Toroid pinch. (*In German.*) Experimentelle Arbeiten zum Problem der kontrollierten Kernfusion. ***E. Fünfer.*** *Elektrotechnik und Maschinenbau*, v. 75, no. 18, Sept. 1958, p. 509-517.

2048* Progress in Controlled Thermonuclear Research in the United States. II. Describes some of the more important classes of experimental devices developed, and the principles and methods applied to overcome the problems of attaining extremely high temperatures and of confining the plasma. *Engineer*, v. 206, Oct. 17, 1958, p. 625-627.

2049* The Advanced Gas-Cooled Reactor, A.G.R. This experimental reactor is intended to stimulate further development of the gas-cooled reactor in the direction of higher temperatures and fuel ratings. It will use uranium oxide canned in beryllium and will operate at four or five times the fuel ratings of today and at temperatures 200 C above those of Calder Hall. *Engineer*, v. 206, Oct. 24, 1958, p. 656-658.

2050* Nuclear Power for the Propulsion of Commercial Shipping. The present state of development of nuclear propulsion for shipping in the light of the technical performance of the U.S. nuclear submarines. Five types of nuclear reactor for propulsion purposes have so far been considered. ***John Cockcroft.*** *Engineer*, v. 206, Nov. 7, 1958, p. 729-731.

2051 Fluid Fuel Reactors. Comprehensive discussion of aqueous homogeneous fused-salt, and liquid-metal fuel systems. ***James A. Lane, H. G. MacPherson, and Frank Maslan, editors.*** 979 pp. 1958. Addison-Wesley Publishing Co., Reading, Mass. (TK9203.F5 L24f)

2052 Coulomb Excitation of Some Deformed U-G-Nuclei. Electric excitation of the two first rotational levels of Au^{197}, Ta^{181}, Lu^{175}, Tm^{169}, Ho^{165}, Tb^{159}, $Eu^{153, 151}$ and $Ag^{109, 107}$ has been studied using protons of 4.05 MeV. (*In German.*) Coulomb-Anregung einiger deformierter u-g-Kerne. ***M. Martin, P. Marmier, and J. de Boer.*** *Helvetica Physica Acta*, v. 31, no. 5, 1958, p. 435-480.

2053* Radiochemistry Solves Problems in Reactor Technology. This article attempts to illustrate the path radiochemistry is taking along the direction of research and development. Since the creation and presence of radioisotopes are characteristic of nuclear reactions, the use of radiochemstry in reactor technology is a natural ramification of these characteristics. ***Paul Kruger.*** *Industrial Science and Engineering*, v. 5, no. 6, Nov. 1958, p. 41-44.

2054 Fission Product Disposal. Nature and magnitude of the problem are discussed; the methods used for its solution in the past are described. Some considration is given to possible future developments. ***K. Saddington.*** *Institution of Chemical Engineers, Transactions*, v. 36, no. 5, 1958, p. 350-364.

2055 Nuclear Criticality—A Novel Factor in the Design and Operation of Chemical Plants. Reviews the relevant neutron physics and discusses methods for the safe design of geometrically simple, isolated solution systems. ***C. M. Nicholls and A. H. C. P. Gillieson.*** *Institution of Chemical Engineers, Transactions*, v. 36, no. 5, 1958, p. 365-372.

2056 Fuel Processing in Homogeneous Aqueous Reactors. It is believed possible to design such a reactor so that more fissile material is produced than is consumed, but in order to do this it is essential to keep to a minimum the wasteful absorption of neutrons in extraneous atoms. ***I. Wells and E. Lofthouse.*** *Institution of Chemical Engineers, Transactions*, v. 36, no. 5, 1958, p. 373-381.

2057* Will the Use of Fusion for Producing Power Be Possible Tomorrow? The basic principles which underlie the possible use of fusion for producing power. The approach making use of the pinch effect is discussed in some detail. (*In French.*) La fusion industrielle est-elle pour demain? ***G. Vendryes.*** *Journal de Physique et le Radium*, v. 19, nos. 8-9, Aug.-Sept. 1958, p. 724-731.

2058 A Cryostat for Reactor Irradiations in Liquid Nitrogen. A liquid nitrogen cryostat which has operated inside the BEPO reactor at Harwell is described. Provision was made for removing irradiated specimens in liquid nitrogen after periods of up to one month. Some difficulties encountered and the methods used to overcome them are discussed. ***M. W. Thompson and D. W. Jefferson-Loveday.*** *Journal of Scientific Instruments*, v. 35, Nov. 1958, p. 397-399.

2059 A Variable Radio-Frequency Inductance for the Birmingham Proton Synchroton. An inductance capable of varying from 26 to 0.033 μH is described. The variation is achieved by saturating a ferroxcube core in a coaxial cavity by means of a large biasing current passing down the center of the inner conductor of the cavity. The inductance is used to tune the Cee of the Birmingham proton synchrotron over the frequency range 0.3-9.6 Mc/s. It is operated at a power level up to 40 kVA. The method and circuits by which the bias current is controlled to give the desired inductance at any frequency are also explained. ***P. H. Rose.*** *Journal of Scientific Instruments*, v. 35, Nov. 1958, p. 399-402.

2060 The Development of Beryllium for Nuclear Reactor Applications. The use of beryllium as a canning material in nuclear reactors, for which purpose it has attractive nuclear and high temperature properties. Discusses the demand for beryllium in this field, toxic hazards, and the initial production of

the metal from the ore. ***G. C. Ellis.*** *Metallurgia*, v. 58, Oct. 1958, p. 173-176.

2061 Radiation Damage in Semiconductors. Studies of the effects of nuclear radiation on semiconductors provide a means of investigating the fundamental nature of radiation damage and the sensitivity of semiconductors to lattice defects. *Military Electronics*, v. 5, Oct. 1958, p. 8 + 3 pages.

2062* The Cerenkov Effect. This discovery which has won the 1958 Nobel Physics Award, has provided physicists with a powerful experimental tool. Its possible applications are many; in particular, it may solve some of the problems of thermonuclear research. ***Tom Margerison.*** *New Scientist*, v. 4, Nov. 6, 1958, p. 1215-1217.

2063* Nuclear Merchant Ships: What Are the Prospects? The idea of passenger and cargo ships powered by nuclear reactors has gripped the popular imagination. Here is a naval architect's cool appraisal of the outlook. He indicates some problems, technical and economic, which have still to be solved. ***A. C. Hardy.*** *New Scientist*, v. 4, Nov. 6, 1958, p. 1218-1219.

2064* Apsara—Asia's First Nuclear Reactor. Asia's first nuclear reactor, "Apsara", fabricated and designed by Indian engineers and scientists is discussed with details given on instruments and control channels. ***A. S. Rao.*** *Nuclear Engineering*, v. 3, Nov. 1958, p. 491-493.

2065* Gamma-Ray Spectrum of Radium in Equilibrium With Its Decay Products. Investigates the radium gamma-spectrum based on recoil electron measurements in the energy range 150-2530 keV. ***B. S. Dželepow, N. N. Zhukovsky, S. A. Shestopalova, and I. F Uchevatkin.*** *Nuclear Physics*, v. 8, no. 3, Oct. 1958, p. 250-264.

2066* Level Density of Degenerate Fermi Systems. The explicit solution as well as approximate formulae in various limiting cases are given for the case when the single Fermion distribution can be analyzed in a power series or a Fourier series. ***Torleif Ericson.*** *Nuclear Physics*, v. 8, no. 3, Oct. 1958, p. 265-283.

2067* Classification of Triton Wave Functions. Classification, based on the behavior of the functions under rotations of the co-ordinate axes and permutations of the three nucleons, yields three S-state functions, four P-state functions, and three D-state functions. ***G. Derrick and J. M. Blatt.*** *Nuclear Physics*, v. 8, no. 3, Oct. 1958, p. 310-324.

2068* Some Problems Encountered in the Theory of the Dispersion Relations. ***A. A. Logunov and A. N. Tavkhelidze.*** *Nuclear Physics*, v. 8, no. 3, Oct. 1958, p. 374-393.

2069* Relations Among Different Models of the Nuclear Photoeffect. Finds agreement in mean energy between the two-fluid collective model and the shell model (finite square well approximated as two Fermi gases). ***J. S. Levinger.*** *Nuclear Physics*, v. 8, no. 4, Oct. 1958, p. 428-443.

2070* Bound States and Scattering of Baryons in Contact Interaction. The possibility of treating π and K mesons as bound states in the four-baryon interaction theory is considered. ***I. V. Polubarinov.*** *Nuclear Physics*, v. 8, no. 4, Oct. 1958, p. 444-460.

2071* Coulomb Energies of Mirror Nuclei. Energies are calculated using the harmonic oscillator sheel model. ***I. Unna.*** *Nuclear Physics*, v. 8, no. 4, Oct. 1958, p. 468-483.

2072* On the Theory of the Linear Betatron. Three cases of electron motion in an axially symmetric magnetic field displacing along the axis are discussed. ***M. V. Konjukov and J. P. Terletskij.*** *Nuovo Cimento*, v. 9, ser. 10, no. 6, Sept. 16, 1958, p. 930-941.

2073* The Nucleon Effective Mass and the Statistical Model of the Nucleus. The determination of the nucleon effective mass is carried out taking into account separately the experimental value of the symmetry energy and of the nuclear level density observed in slow neutron capture experiments. ***E. Clementel and C. Villi.*** *Nuovo Cimento*, v. 9, ser. 10, no. 6, Sept. 16, 1958, p. 950-989.

2074 The Decay of Neodymium-147. The β transitions from ^{147}Nd have been studied in the new prolate spheroidal field spectrometer. Based on results, a new mode of decay is proposed. ***P. Rice Evans.*** *Philosophical Magazine*, v. 3, ser. 8, Oct. 1958, p. 1061-1068.

2075 Further Studies of Anomalous Inelastic Proton Scattering. Scattering was studied by determining its dependence on bombarding energy, measuring the energy distributions with greatly improved energy resolution, extending the data to separated isotopes and to elements not previously investigated because of target preparation difficulties, and observing the energy distribution of the de-excitation gamma rays following the reaction. ***Bernard L. Cohen and Allen G. Rubin.*** *Physical Review*, v. 111, ser. 2, no. 6, Sept. 15, 1958, p. 1568-1577.

2076 Gamma-Ray Decay in Hg^{200}. γ-γ cascades following thermal neutron capture in Hg^{199} have been measured. A three-crystal pair spectrometer was used to measure the high-energy gamma rays and a single NaI(Tl) crystal spectrometer detected the lower energy radiation. ***R. E. Segel.*** *Physical Review*, v. 111, ser. 2, no. 6, Sept. 15, 1958, p. 1620-1630.

2077 Photomeson Production in Intermediate Coupling. The wave functions for the ground state of a physical nucleon and for the scattering state of a physical nucleon and a pion are used to compute photopion production cross sections in an intermediate-coupling approximation. ***Kurt Haller.*** *Physical Review*, v. 111, ser. 2, no. 6, Sept. 15, 1958, p. 1736-1745.

2078 Nuclear Spin-Electron-Neutrino Correlation in Forbidden β Decay. The distribution function correlating the electron and neutrino momenta with the spin orientation of the parent or daughter nucleus is calculated for forbidden transitions with Coulomb effects included. ***Adam M. Bincer.*** *Physical Review*, v. 112, ser. 2, no. 1, Oct. 1, 1958, p. 244-258.

2079 The Elastic Scattering of Protons by Tritons and ^{3}He. Paper describes the extension of earlier work on the elastic scattering of neutrons by tritons and ^{3}He to proton scattering over the energy range 1 to 14 mev. Cross sections and phase shifts are calculated assuming central two body interactions, of various exchange types and of Gaussian radial form. ***B. H. Bransden and H. H. Robertson.*** *Physical Society, Proceedings*, v. 72, Nov. 1958, p. 770-780.

2080 The Physical Theory of Neutron Chain Reactors. As a unified and definitive account of the mathematical and physical theory underlying the design of nuclear power reactors, this book incorporates a wealth of theoretical and empirical research, much of it original. It is the only comprehensive and up-to-date study of the entire field of nuclear reactor physics. ***Alvin M. Weinberg and Eugene P. Wigner.*** 801 pp. 1958. The University of Chicago Press, Chicago. (QC173 W43p)

2081 Hydromagnetic Instability in Stellarator. Shows that the presence of external conductors is unimportant. When effects of the finite length of the machine are considered, a critical current is obtained below which the system is stable to this displacement. ***M. D. Kruskal, J. L. Johnson, M. B. Gottlieb, and L. M. Goldman.*** *Physics of Fluids*, v. 1, no. 5, Sept.-Oct. 1958, p. 421-429.

2082* Nuclear Superheating Can Be Used for Boiling Reactor. Since work began on the CRBR project in May 1957, rapid progress has been made in the initial design of the reactor. ***C. B. Graham.*** *Power*, v. 102, Nov. 1958, p. 94 + 3 pages.

2083* Parity Nonconservation and the Beta-Spectrum of RaE. ***Jun-Ichi Fujita, Masami Yamada, Zyun-Itiro Matumoto, and Seitaro Nakamura.*** *Progress of Theoretical Physics*, v. 20, no. 3, Sept. 1958, p. 287-307.

2084 Project Sherwood. The U. S. Program in Controlled Fusion. Developments in the program of research on thermonuclear reactions from its inception in 1951 to the early part of 1958. Describes basic principles; the problem of confinement; the pinch, stellarator, and magnetic mirror programs; and shock wave and other experiments. ***Amasa S. Bishop.*** 216 pp. 1958. Addison-Wesley Publishing Co., Reading, Mass. (QC789.S5 B54p)

2085 Reactor Fuel Processing. Presents six papers on the subject, including waste disposal and final productive conversion. *Reactor Fuel Processing*, v. 1, no. 4, Oct. 1958, 31 pp.

2086 Report on the Activities of the Danish Atomic Energy Commission Up to 31 March 1957. The first report of the Danish Atomic Energy Commission, which was presented in October 1957, covers the Commission's activities from its establishment until the end of the fiscal year 1956/57. 43 pp. Jan. 1958. (Pamphlet)

2087 Alpha-Particle Irradiation Apparatus. An apparatus having up to four Po^{210} sources suitable for radiation chemistry studies in liquids is described. Each unit consists of a source and housing that supplies a collimated beam of α particles, a variable speed stirrer, and an irradiation cell holder. Energy output is measured with the ferrous sulfate dosimeter. ***Edwin J. Hart and John Terandy.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 962-965.

2088 Detection of Fast Neutrons by the Associated Particle Method. The associated particle method of neutron detection has been used to reduce the background in measurements of the total cross section using neutrons from the $D(d,n)He^3$ reaction and to measure the time-of-flight of the neutrons that are inelastically scattered when elements are bombarded with $T(d,n)He^4$ neutrons. The techniques used are described. ***P. L. Okhuysen, E. W. Bennett, J. B. Ashe, and W. E. Millett.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 982-985.

2089 Gamma-Ray Resolution of Larger NaI(Tl) Scintillators. The various factors affecting the gamma-ray energy resolution of NaI(Tl) scintillation spectrometers have been investigated experimentally with commercially packaged 2.5- and 5-in. diam scintillators and routinely available 3- and 5-in. photomultipliers. The resolution contains contributions from the scintillator light yield, photocathode efficiency, intrinsic resolution due to the material NaI(Tl) and two terms involving the effects of various spatial inhomogeneities in the packaged scintillator and photomultiplier. ***R. L. Hickok and J. E. Draper.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 994-999.

2090 Magnetic Analyzer for Nuclear Reaction Products. A magnetic analyzer for nuclear reaction products has been built which employs a sector-shaped uniform magnetic field. The shaped sectors are inserted in the 8.5-in. gap of a C-shaped magnet with a 12 x 12 in. cross section. The iron core is 54 x 33 in., and 69,360 ampere-turns give 13,500 gauss across a total air gap of 1¾ in. ***Otto Meier, Jr., N. R. Fletcher, W. R. Wisseman, and R. M. Williamson.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 1004-1008.

2091 Palladium Film Dosimeter. A PdO film electrical resistor, mounted on an insulating base and surrounded with a hydrogenous material, has been investigated for use as a neutron dosimeter. It was found that the resistance of such film was lowered from several thousand to a few ohms upon being irradiated either in a reactor or in a pure gamma-ray field. The cause of this resistance change was determined to be the evolution of hydrogen gas during irradiation, which reduced the PdO to Pd. ***H. M. Childers.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 1008-1010.

2092* Muon Angular Distribution From Pion Decay in Emulsions. An investigation on the angular distribution of μ-mesons originating in π decays in nuclear emulsion is carried out. Measurements performed on 6978 mesons are discussed. ***Carlo Castagnoli, Massimiliano Ferro-Luzzi, and Augusta Manfredini.*** *Ricerca Scientifica*, v. 28, Aug. 1958, p. 1644-1649.

2093* Testing an Aircraft Nuclear Propulsion System. Tests of the HTRE power system. ***Herman Miller.*** *SAE Journal*, v. 66, Nov. 1958, p. 26-28.

2094 Non-Military Uses of Nuclear Explosives. Research under the Plowshare program seeks constructive use for nuclear detonations. Underground explosions may be used for power production and mining; surface explosions may excavate harbors. ***Gerald W. Johnson and Harold Brown.*** *Scientific American*, v. 199, no. 6, Dec. 1958, p. 29-35.

2095 The Shippingport Pressurized Water Reactor. Design philosophy, equipment, chemistry, safety procedures, construction details, preparation for operation, tests. 588 pp. 1958. Addison-Wesley Publishing Co., Reading, Mass. (TK1377.S45 Sh64)

2096 Sodium Graphite Reactors. Principles; SRE equipment and operation. Construction, components, fuel, operating procedures; economic aspects. ***Chauncey Starr and Robert W. Dickinson.*** 288 pp. 1958. Addison-Wesley Publishing Co., Reading, Mass. (TK9203.S6 St28s)

2097 Solid Fuel Reactors. Reviews basic concepts, present status in the U. S., and technical and economic outlooks for five projected nuclear power reactor types: the fast-neutron breeder, the heavy water, gas-cooled, organic moderated and cooled reactors, and a thermal reactor for recycling Pu. ***Joseph R. Dietrich and Walter H. Zinn, editors.*** 844 pp. 1958. Addison-Wesley Publishing Co., Reading, Mass. (TK9203.S6 D36s)

2098 Containment of Fragments From Runaway Reactor. The important questions are the velocity necessary to penetrate the shell and the probability of obtaining such velocities in a nuclear reactor excursion. Presents the results of a detailed theoretical and experimental examination of the process of penetration of a plate by a rod. ***N. R. Zabel.*** *Stanford Research Institute, Technical Report No.* 1, Apr. 2, 1958, 88 pp. (QC125 St24t Contin.)

2099* Comparison of the Physical Properties of a Few Types of Fuel Elements. In connection with a general comparative study of D_2O-moderated pressure-vessel and pressurized-tube reactors, the material buckling of two structurally different composite fuel elements of natural uranium was investigated. ***P. Lehmann, R. W. Meier, and J.-P. Schneeberger.*** *Sulzer Technical Review*, v. 40, no. 3, 1958, p. 33-39.

2100 The Transuranium Elements. Chemical and nuclear properties of the known synthetic transuranium elements. Prospects for future transuranium elements. ***Glenn T. Seaborg.*** 328 pp. 1958. Addison-Wesley Publishing Co., Reading, Mass. (QD172.T7 S11te)

2101 Inelastic Scattering of Fast Neutrons From Nitrogen and Oxygen. Study was made to determine, when possible, inelastic neutron cross sections and gamma ray production cross sections. ***Norman A. Bostrom, et al.*** *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 58-88, Feb. 1958, 59 pp. (TL507 Un3.18w Vis.)

2102 Safeguard Report. Livermore Pool Type Reactor. The LPTR is designed as a versatile research facility to serve the programs of the Livermore Laboratory. Radioactive effluents from the reactor are prevented from entering the external environment by enclosing the reactor in a steel building. ***Robert L. Detterman, editor.*** *U. S. Atomic Energy Commission, AECD*-4258, 1956, 118 pp. (UF767 Un3m Contin.)

2103 Final Physics Report for the Engineering Test Reactor. ***W. Cegelski and W. Machell.*** *U. S. Atomic Energy Commission, AECU*-3607, (v. II), June 25, 1956, p. 285-561. (UF767 U3au Contin.)

2104 Irradiation of Prototype CP-4 (EBR-I) Reactor Fuel Slugs in the CP-3' Goat Hole. Experiments are described which studied the effect of irradiation upon small U^{235} cylinders simulating in size those designed for the initial CP-4 (EBR-I) fuel loading. ***S. H. Paine, P. J. Persiani, and W. F. Murphy.*** *U. S. Atomic Energy Commission, ANL*-5855, Aug. 1958, 24 pp. (UF767 Un3.1an Contin.)

2105 A Study of Heavy Water Central Station Boiling Reactors (CSBR). The reactors which are described and studied in this report are of the boiling heavy water type, designed for economic operation in stationary central power plants. ***M. Treshow, D. Shaftman, L. Templin, M. Petrick, B. Hoglund, and L. Link.*** *U. S. Atomic Energy Commission, ANL*-5881, Sept. 1958, 81 pp. (UF767 Un3.1an Contin.)

2106 Corrosion Product Activity in the Primary System of the Army Package Power Reactor. This report presents the results of radiochemical analyses of water and crud sampled from the primary system, and of deposits removed from the surface of metal test specimens exposed to the primary coolant.

In addition, the dose rates measured during reactor shutdown at the external surfaces of primary system components are reported. *U. S. Atomic Energy Commission, APAE-29*, Apr. 15, 1958, 70 pp. (UF767 Un3-1apa Contin.)

2107 Gamma Ray Energy Spectra From Thermal Neutron Capture. Energy spectra of gamma rays resulting from capture are compiled for 48 elements. Other physical properties are included. ***F. E. Deloume.*** *U. S. Atomic Energy Commission, APEX-407*, Aug. 1958, 54 pp. (UF767 Un3.1ap Contin.)

2108 Plutonium Recycle in the Calder Hall Type Reactor. A supplemental report to AECU-3398 on the economics and physics of plutonium recycle in the Calder Hall type reactor. Four possible schemes of recycle are considered. ***L. J. Barbieri, J. W. Webster, and K. T. Chow.*** *U. S. Atomic Energy Commission, ASAE-S-8*, Jan. 1, 1958, 107 pp. (UF767 Un3.1as Contin.)

2109 Progress Relating to Civilian Applications During August, 1958. Compilation of articles relating to civilian applications of nuclear energy. ***Russell W. Dayton and Clyde R. Tipton, Jr.*** *U. S. Atomic Energy Commission, BMI-1286*, Sept. 1, 1958, 50 pp. (UF767 U3b Contin.)

2110 Elastic and Inelastic Neutron Cross Sections. Presents the methods of analysis and the results of a series of cross-section studies. The results herein are complete and usable in their present form. ***Devereux L. Kavanagh and C. E. Mandeville.*** *U. S. Atomic Energy Commission, CWR-4040*, June 1958, 160 pp. (UF767 Un3.1cw Contin.)

2111 Cobalt-60 Production Reactor. A study of a possible reactor facility designed and operated solely for the production of cobalt-60. *U. S. Atomic Energy Commission, IDO-16421*, June 7, 1957, 137 pp. (UF767 Un3.1id Contin.)

2112 Maintenance of ETR Coolant. The ETR is a thermal reactor using ordinary demineralized water as coolant and moderator. Three resin beds are used for activity reduction and to improve the water quality. ***F. C. Haas.*** *U. S. Atomic Energy Commission, IDO-16463*, Aug. 15, 1958, 11 pp. (UF767 Un3.1id Contin.)

2113 A Standard Practices Guide for Hazard Analysis of Experimental Systems. A guide for experiment sponsors in performing hazard analyses of experimental systems at the MTR and ETR. The requirements for such analyses are described in general terms. ***R. J. Nertney.*** *U. S. Atomic Energy Commission, IDO-16466*, Sept. 8, 1958, 43 pp. (UF767 Un3.1id Contin.)

2114 Operational Status of the Engineering Test Reactor as of March 1, 1958. Solutions to most of the major problems have been found and the reactor has operated successfully at an 80 MW power level for 2,000 MWD. ***J. H. Rainwater.*** *U. S. Atomic Energy Commission, IDO-16473*, July 31, 1958, 16 pp. (UF767 Un3.1id Contin.)

2115 Quarterly Progress Report for MTR-ETR Technical Branches. *R. G. Fluharty, editor.* *U. S. Atomic Energy Commission, IDO-16474*, Sept. 2, 1958, 60 pp. (UF767 Un3.1id Contin.)

2116 Metallurgical Examination of a Melted Spert-I Type-B Fuel Plate. Concludes that the break resulted from temperatures exceeding the melting points of the 6061 aluminum cladding and the core material. ***W. O. Schaffnit.*** *U. S. Atomic Energy Commission, IDO-16477*, Sept. 18, 1958, 18 pp. (UF767 Un3.1id Contin.)

2117 Tables of Reactivity Vs. Period For U^{235}, Pu^{239}, and U^{233}. Experimentally measured periods can be used in conjunction with the inhour equation to calculate corresponding reactivity changes. Tables of reactivity vs. period have been computed on three fuels. ***K. V. Moore.*** *U. S. Atomic Energy Commission, IDO-16485*, Sept. 10, 1958, 69 pp. (UF767 Un3.1id Contin.)

2118 An In-Pile Loop Study of the Performance of Polyphenyl Reactor Coolants. An in-pile loop experiment was performed to evaluate several promising polyphenyl materials for use as reactor moderator coolants. ***William N. Bley.*** *U. S. Atomic Energy Commission, NAA-SR-2470*, Sept. 15, 1958, 143 pp. (UF767 Un3.1na Contin.)

2119 Two Beryllium-Moderated Critical Assemblies. Two unreflected assemblies using beryllium as the moderator and 93.4% enriched uranium metal as the fuel were built to provide a basis for the evaluation of certain reactor calculational procedures. Control and safety rods of the core-element-removal type were used in order that the final assemblies would not be complicated by strong absorber rods. ***E. L. Zimmerman.*** *U. S. Atomic Energy Commission, ORNL-2201*, Oct. 21, 1958, 60 pp. (UF767 U3o Contin.)

2120 Review of Experimental and Theoretical Studies Concerning the Age of Fission Neutrons in Heavy Water. The results of four separate measurements of the age of fission neutrons to indium resonance in heavy water range between 104 and 111 cm^2 and are in close agreement considering the experimental errors involved. ***M. Tobias.*** *U. S. Atomic Energy Commission, ORNL-2575*, Oct. 17, 1958, 18 pp. (UF767 U3o Contin.)

2121 Neutron Physics Division Annual Progress Report for Period Ending Sept. 1, 1958. *U. S. Atomic Energy Commission, ORNL-2609*, Oct. 29, 1958, 152 pp. (UF767 U3o Contin.)

2122 Reactor and Plant Engineering. *U. S. Atomic Energy Commission, WAPD-BT-9*, Aug. 1958, 91 pp. (UF767 Un3.1wb Contin.)

2123 Pressurized Water Reactor (PWR) Project. June 24, 1958 to Aug. 23, 1958. Covers power plant analysis and systems, reactor design, core engineering, metallurgy, and physics. *U. S. Atomic Energy Commission, WAPD-MRP-75*, 1958, 75 pp. (UF767 Un3.1wa Contin.)

2124 Maintenance Studies for an LMFR and LMFRE. An intensive study of the remote maintenance and handling problems of the LMFRE to permit an evaluation of the feasibility and cost of maintaining a large nuclear power plant based upon the LMFR concept. ***J. H. Frankfort and Philip Miller.*** *U. S. Atomic Energy Commission, WKNL-106*, Jan. 3, 1958, 103 pp. + plates. (UF767 Un3.1wk Contin.)

2125 U. S. Research Reactor Operation and Use. Describes the various types of reactors, their characteristics, operating problems (administrative and legal as well as technical), safety considerations, and costs. Some reactor theory is included to provide the reactor user with a few basic concepts and an understanding of some common terms. ***Joel W. Chastain, Jr., editor.*** 366 pp. 1958. Addison-Wesley Publishing Co., Reading, Mass. (QC787.N8 C38u)

2126* Inelastic Scattering of 300 MeV Positive and Negative Mesons on Photographic Emulsion Nuclei. Results of measurement of the cross sections for inelastic scattering and of the angular distributions and energy spectra of inelastically scattered π^+-mesons of 300 MeV energy of photographic emulsion nuclei are presented. (*In Russian.*) Neuprugoe rasseianie polozhitel'nykh i otritsatel'nykh π-mezonov s energieĭ 300 MeV na iadrakh fotoemul'sīĭ. ***G. E. Belovitskiĭ.*** *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, v. 35, no. 4, Oct. 1958, p. 838-844.

2127* Investigation of the $n + p \rightarrow \pi^0 + d$ Reaction for 660 MeV Effective Energy Neutrons and the Hypothesis of Charge Independenc. The angular distribution and total cross section for production of π^0-mesons in the $n + p \rightarrow \pi^0 + d$ reaction has been investigated for 660 MeV neutrons. (*In Russian.*) Izuchenie reaktsii $n + p \rightarrow \pi^0 + d$ pri effketivnoĭ energii neĭtronov 600 MeV i gipoteza zariadovoĭ nezavisimosti. ***V. B. Fliagin, V. P. Dzhelepov, V. S. Kiselev, and K. O. Oganesian.*** *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, v. 35, no. 4, Oct. 1958, p. 854-867.

2128* Positron Spectrum of $Eu^{152,154}$. The spectrum of positrons emitted in the decay of $Eu^{152,154}$ has been measured. (*In Russian.*) Pozitronnyĭ spektr $Eu^{152,154}$. ***D. L. Kaminskiĭ and M. G. Kaganskiĭ.*** Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki, v. 35, no. 4, Oct. 1958, p. 926-931.

2129* Types of Interaction in β-Decay. Electron-neutrino correlation in the β-decay of Na^{24} was investigated by the method of nuclear resonance scattering of Mg^{24} γ-rays accompanying the β-decay of Na^{24}. A gaseous Na^{24} source was

employed. (*In Russian.*) Varianty vzaimodeĭstviia pri β-raspade. Raspad Na^{24}. ***N. A. Burgov and Iu. V. Terekhov.*** *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, v. 35, no. 4, Oct. 1958, p. 932-939.

2130* Calculation of the Physical Dosage of γ-Irradiation. II. The Dosage Intensity From a Flat and a Tri-Dimensional Source. Based on the approximate account of the scattering of γ quanta in air and in various materials, a number of formulas are derived allowing one to calculate the dosage intensity from flat and tri-dimensional sources, depending upon the energy of the γ radiation, the surface or bulk concentration and the distances from the sources and their sizes. (*In Russian.*Q Raschet fizicheskoĭ dozy γ-izlucheniia. II. Moshchnost' dozy ot ploskogo i obemnogo istochnikov. ***I. A. Kalinin and P. Ia. Vertebnyi.*** *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 9, Sept. 1958, p. 2192-2198.

See also: **1355** (analytical chemistry in nuclear reactor technology); **1604** (cost of Co-60); **1729** (microscope for study of particle tracks); **2172** (nuclear reactor heat transfer).

OPERATIONS RESEARCH AND MANAGEMENT ENGINEERING

2131* Good Management With "Completed Work". Completed work means work which is developed so thoroughly by subordinates that the manager can, in reviewing a single package, determine the nature of the project, all the factors which bear on the assignment, the alternatives worthy of consideration, the recommendation of the subordinate, and the reasons for proposed action. ***G. E. Feldman.*** *Allis-Chalmers Electrical Review*, v. 23, no. 3, 1958, p. 25-28.

2132 Management and the Engineer. Concludes that Great Britain needs broader education, better leadership, and more enlightened management at every level. ***Ewart Smith.*** *Chartered Mechanical Engineer*, v. 5, no. 9, Nov. 1958, p. 434-441.

2133 Technician Survey Urged. Claims a shortage of technicians keeps industry from making full use of scientists. Suggests survey to find out how many technicians are needed. *Chemical and Engineering News*, v. 36, no. 45, Nov. 10, 1958, p. 36-37.

2134 Automatic Numerical Data Logging and Processing in the Steel Industry. Outlines briefly how data logging and processing fit into the more completely automated processes to be seen in the future. ***R. M. Sills and G. E. Terwilliger.*** *Iron and Steel Engineer*, v. 35, Nov. 1958, p. 101-109.

2135* Functional Supervision. Treats supervision as an entity, influenced by the on-going general economy, the organization within which the supervision is practiced, the *mores* of those being supervised, and the make-up of those supervising. ***Harry L. Coderre.*** *Journal of Industrial Engineering*, v. 9, no. 5, Sept.-Oct. 1958, p. 417-420.

2136* Top Management Decision and Simulation Processes. Objectives, processes, and problems in top management decision games. ***Richard Bellman.*** *Journal of Industrial Engineering*, v. 9, no. 5, Sept.-Oct. 1958, p. 459-464.

2137 Defining the Manager's Job. Results of a survey by the American Management Association of current practices among 140 companies that have had considerable experience with position descriptions on the managerial level. ***C. L. Bennett.*** *Management Review*, v. 47, Nov. 1958, p. 26 + 11 pages.

2138 Personnel Administration in Libraries. Presents helpful information about modern personnel practices, regardless of whether the staff consists of fewer than ten persons, or many times that number, or whether they serve in public, county, school, college, university, or special libraries. The suggestions will need to be modified to fit local conditions, and none should be adopted without first considering the local situation. ***Kathleen B. Stebbins.*** 304 pp. 1958. The Scarecrow Press, New York. (Z678 St31p)

2139* Effective Supervision: An Adaptive and Relative Process. All of the perceptions, expectations, values, and interpersonal skills of the subordinate influence his response to each act of his superior. Supervision is, therefore, an adaptive and relative process. ***Rensis Likert.*** *Personnel Psychology*, v. 11, no. 3, Autumn 1958, p. 317-332.

2140* The Prediction of Turnover of Clerical Employees. Constructs a meaningful selection instrument which would enable prediction of probable tenure for female clerical applicants. ***Frank J. Minor.*** *Personnel Psychology*, v. 11, no. 3, Autumn 1958, p. 393-402.

2141* Dimensions of Employee Morale. Concludes that, while there is a specificity of employee attitudes, there is a general attitude which biases this specificity. Recommends that differential attitude surveys be interpreted in the light of this general attitude. ***Darrell E. Roach.*** *Personnel Psychology*, v. 11, no. 3, Autumn 1958, p. 419-431.

2142 Automation and Business Methods. Automation in business gives management better control, and data processing equipment is the means to this end. ***T. C. Hudson.*** *Research*, v. 11, Nov. 1958, p. 415-418.

2143* Engineering Manpower Utilization. States that more careful thinking by management will lead to the end result of increasing engineering productivity per engineering dollar spent. ***George P. Humfeld.*** *SPE Journal*, v. 14, Nov. 1958, p. 45-46.

ORE AND MATERIALS BENEFICIATION

2144 Production of Pellets From Ore Concentrates and Ore Fines. Report on a new Russian development featuring the use of screw presses as primary agglomerators for fine concentrates from lean ores, followed by a drum for further densification and rounding off the originally cylindrical uniform-size briquets into spherical pellets of identical size. ***F. M. Bazanov, F. F. Kolesanov, I. L. Malkin, and S. I. Sharov.*** *Henry Brutcher Translation No.* 4233, 13 pp. (From *Stal'*, v. 18, no. 4, 1958, p. 289-294.) Henry Brutcher, Altadena, Calif.

2145 Effect of Basicity of [Fluxed] Sinter Upon Coke Consumption and Production of Blast Furnaces. Relationship between coke rate and sinter basicity; savings on coke to be expected by omitting part of the raw limestone from charge. ***I. B. Strashnikov, A. G. Astakhov, G. V. Ksendzyk, N. V. Fedorovskii, and K. A. Shimilov.*** *Henry Brutcher Translation No.* 4298, 15 pp. (From *Stal'*, v. 18, no. 5, 1958, p. 398-402.) Henry Brutcher, Altadena, Calif.

2146 Mineralogic Make-up of Sinter From Krivoi-Rog Iron Ores. Contribution to blast-furnace sinter mineralogy for a better understanding of the processes occurring in sintering. ***E. F. Vegman.*** *Henry Brutcher Translation No.* 4326, 7 pp. (From *Zavodskaya Laboratoriya*, v. 24, no. 4, 1958, p. 444-446.) Henry Brutcher, Altadena, Calif.

2147 Kinetics of Reduction of Magnetic Iron Ore at the Transformation Temperatures of Iron. Search for a possible correlation between change of properties of iron at its transformation temperatures and rate of reduction of iron oxides under the same conditions. ***M. I. Kochnev and A. F. Plotnikova.*** *Henry Brutcher Translation No.* 4340, 12 pp. (From *Izvestiya Akademii Nauk SSSR, Otd. Tekhn. Nauk*, no. 4, Apr. 1958, p. 118-121.) Henry Brutcher, Altadena, Calif.

2148 The Settling Behavior of Uranium Trioxide-Water Slurries. Settling rates of UO_3-water slurries in the range of 100 to 800 grams per liter at temperatures of 25 and 53 C are measured. The applicability of several equations to relate the rate of hindered settling to surface area, concentration, and viscosity has been examined. ***A. W. Boyd and J. L. Whitton.*** *Canadian Journal of Chemical Engineering*, v. 36, no. 6, Dec. 1958, p. 277-281.

2149* Hydrocyclones in Ore and Mineral Dressing. II. Determination of construction and movement parameters, their influence on characteristic sizes, hydrocyclone efficiency, and size of a boundary grain. (*In Polish.*) Hydrocyklony w prze-

róce rud i minerałów. II. ***Stanisław Bednarski.*** *Rudy i Metale Niezelazne*, v. 3, no. 2, Apr.-June 1958, p. 37-42.

2150* Collective Properties of Thiourea and Its Derivatives During the Flotation of Galena. Use of methyl derivatives instead of thiocrabonylid improves the yield during the flotation of Pb and Zn ores. (*In Polish.*) Własności zbierajace dwufenylotiomocznika i jego pochodnych przy flotacji galeny. ***Władysław Kozak and Kazimierz Żmudziński.*** *Rudy i Metale Niezelazne*, v. 3, no. 2, Apr.-June 1958, p. 42-49.

2151* The Alkaline Process of Producing Electrolytic Zinc From Poor Zinc-Bearing Ores and Residues. Investigations on recovering Zn from blast furnace and converter dusts, Moor filter slimes and from poor calamine-ores by means of Na leaching. An efficiency of 94% was achieved with dust leaching. From the resulting solutions Zn was electrodeposited in the form of powder at a current efficiency of 90% and energy consumption of 2.9kWh/kg Zn. (*In Polish.*) Alkaliczny proces otrymywania cynku elektrolitycznego z ubogich rud i odadów cynkonośnych. ***Władysław Rutkowski, and Bogumiła Winsch.*** *Rudy i Metale Niezelazne*, v. 3, no. 2, Apr.-June 1958, p. 50-57.

2152* Detinning of Tungsten Concentrates. Tungsten concentrate, a raw material for iron–tungsten, contains 1.12% Sn. The tolerable Sn content is 0.15%. By roasting in a rotary kiln with addition of 10% of coking duff at 900 C, a roasting product of 0.12% Sn was obtained. (*In Polish.*) Odcynowanie koncentratów wolframowych. ***B. Seweryński. T. Wlazińska. J. Wojtas, and H. Wojtkiewicz.*** *Rudy i Metale Niezelazne*, v. 3, no. 2, Apr.-June 1958, p. 57-60.

2153 The Effect of Silicon in the Reprocessing of a Uranium Aluminum Alloy. The insoluble residues produced during the reprocessing of certain nuclear fuel elements containing Al, Si, and U were investigated with respect to particle size, shape, distribution, composition, and surface active tendencies. ***O. W. Parrett and K. L. Rohde.*** *U. S. Atomic Energy Commission, IDO*-14441, July 28, 1958, 25 pp. (UF767 Un3.1id Contin.)

2154 Uranium Ore Processing. The technology of winning U from its ores is described, starting with occurrence and sources, exploration and mining, sampling, analysis, and mineralogy of the ore. Covers preliminary treatments, leaching, separation of leach liquor, and recovery of the U product from solution. Typical plants are described and health and safety measures in milling and mining operations are discussed. ***John W. Clegg and Dennis D. Foley, editors.*** 436 pp. 1958. Addison-Wesley Publishing Co., Reading, Mass. (TN490.U7 C58u)

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2155 Study of the Intensity Distribution of the Light Diffracted by Ultrasonic Waves. In some cases Mertens' modifications were significant but there remain deviations between theory and experimental results which suggest that the actual experimental conditions deviate from the usual theoretical assumptions. ***R. B. Miller and E. A. Hiedeman.*** *Acoustical Society of America, Journal*, v. 30, Nov. 1958, p. 1042-1046.

2156* On the Absence of Superconductivity in Ferromagnetics. (*In Russian.*) K voprosu ob otsutstvii sverkhprovodimosti v ferromagnetikakh. ***S. V. Vonsovskiĭ and M. S. Svirskiĭ.*** *Akademiia Nauk SSSR, Doklady*, v. 122, no. 2, Sept. 11, 1958, p. 204-207.

2157* Sound Velocity Dispersion and Hypersound Propagation in Liquids. The average hypersound velocity was 1245±36 m/sec. in methyl chloride and 1099±30 m/sec. in methyl bromide. Ultrasound absorption was fully conditioned by the relaxation mechanisms. (*In Russian.*) Dispersiia skorosti zvuka i rasprostranenie giperzvuka v zhidkostiakh. ***M. S. Pesin and I. L. Fabelinskiĭ.*** *Akademiia Nauk SSSR, Doklady*, v. 122, no. 4, Oct. 1, 1958, p. 575-577.

2158* Molecular Light Scattering in Viscous Liquids and Amorphous Solids. Selection of objects for investigation and their preparation. Methods of measuring intensity and depolarization degree of scattered light, coefficient of measure expansion and density, and index of refraction. Determination of the compressibility factor. Results of these measurements and consideration of the results. (*In Russian.*) Molekuliarnoe rasseianie sveta v viazkikh zhidkostiakh i tverdykh amorfnykh telakh. ***T. S. Velichkina.*** *Akademiia Nauk SSSR, Fizicheskii Institut, Trudy*, v. 9, 1958, p. 59-124.

2159* Electron-Optic Properties of a Quadruple Electrostatic Lens (In Relativistic Approximation). Formulae were derived for focal distances and coordinates of the principal points. Values necessary for the calculation of the coefficients are given for a number of lenses. (*In Ukrainian.*) Elektronno-optichni vlastivosti kvadrupol'noĭ elektrostatichnoĭ linzi (v reliativists'komu nablizhenni. ***O. M. Strashkevich.*** *Akademiia Nauk Ukrains'koi RSR, Dopovidi*, 1958, no. 9, p. 929-932.

2160 New Look at von Neumann's Operator Method in Quantum Statistics. II. The quantum-mechanical equation of change with time is applied to an ensemble, and the quantum-mechanical analog of the classical Liouville theorem is derived. ***William Band.*** *American Journal of Physics*, v. 26, no. 8, Nov. 1958, p. 540-548.

2161 Laws of Conservation: Parity and Time Reversal. The concept of conservation of parity is explained, and the reason for the usual transformation laws for electric charge, electric field, magnetic pole, and magnetic field as scalar, vector, pseudo-scalar, and pseudo-vector, respectively is traced to the requirement that the laws of electromagnetism be invariant under inversion. ***Ta-You Wu.*** *American Journal of Physics*, v. 26, no. 8, Nov. 1958, p. 568-576.

2162 Newton and the Cause of Gravity. Newton attempted to explain the force of gravity on two hypotheses: the existence of a medium, or ether, and action at a distance. For involvement in the ether theory obscured from Newton the universal character of the inverse-square relation, and delayed for twenty years his final formulation of the law of gravity. ***Melbourne G. Evans.*** *American Journal of Physics*, v. 26, no. 9, Dec. 1958, p. 619-624.

2163* The Wave Function of Nuclear Matter. A two-body correlation amplitude is derived from the Bethe-Goldstone equation. This correlation amplitude is used to construct a wave function for the A-particle system. It is shown that this wave function is an approximate eigen-function for the A-particle Schrödinger equation. ***A. de-Shalit and V. F. Weisskopf.*** *Annals of Physics*, v. 5, Nov. 1958, p. 282-298.

2164* Far Field Scattering From Bodies of Revolution. By use of approximations based on physical reasoning radar cross-section results for bodies of revolution are found. ***K. M. Siegel.*** *Applied Scientific Research, Sec. B, Electrophysics, Acoustics, Optics, Mathematical Methods*. v. 7, no. 4, 1958, p. 293-328.

2165* Ether and Relativity. Interaction of bodies and physical systems with the universe cannot be described in terms of Mach's hypothesis. There is therefore no alternative to the ether hypothesis. It is shown that this is compatible with the restricted theory of relativity and even provides a tenable basis, when taken together with the principle of relativity, for that theory. ***G. Builder.*** *Australian Journal of Physics*, v. 2, no. 3, Sept. 1958, p. 279-297.

2166* Encyclopedia of Physics, v. XII. Thermodynamics of Gases. (*In English and German.*) Handbuch der Physik. v. XII. Thermodynamik der Gase. ***S. Flugge, editor.*** 686 pp. 1958. Springer-Verlag, Berlin. (QC21 G27h3 Ref.)

2167* Magnetic Properties of Magnetic Anisotropic Ferromagnetic Powder Specimens. IV. Effect of Temperature on the Magnetic Properties of MnBi Powder Specimens. The presence of various magnetic structures was found at different temperatures. The change is related to decrease in anisotropy. (*In Russian.*) Magnitny svoistva magnitno-anizotropnykh obraztsov iz ferromagnitnykh poroshkov. IV. Temperaturnaia zavisimost' magnitnykh svoistv poroshkovykh obraztsov splava MnBi. ***Ia. S. Shur, E. V. Shtol'ts, and G. S. Kandaurova.*** *Fizika Metallov i Metallovedenie*, v. 6, no. 3, 1958, p. 420-425.

2168* Hondbook of Physics. Comprehensive compilation of basic principles in fields of mathematics, mechanics of particles and rigid particles, mechanics of deformable bodies, electricity and magnetism, heat and thermodynamics, atomic physics, the solid state, and nuclear physics. ***E. U. Condon and Hugh Odishaw, editors.*** Sections individually paged. 1958. McGraw-Hill, New York. (QC21 H19 Ref.)

2169* Dielectric Constant of Hydrogen-Bonded Liquids. A simple extension is presented of Onsager's electrostatic theory of dielectric polarization to take account of the "excess" polarization due to H bonding. Dielectric data for a number of liquid mixtures are analyzed and the deviations from ideal behavior expressed in terms of an excess polarization. A method is developed for calculating the excess polarization and certain related molecular parameters. Tentative values of these parameters have been determined for some particularly simple structures. ***Floyd Buckley.*** *Journal of Research, National Bureau of Standards,* v. 61, no. 4, Oct. 1958, p. 325-342.

2170 Low Temperature Physics & Chemisty. Summarizes, in 225 papers, the material presented at the Fifth International Conference on Low Temperature Physics and Chemistry held at the University of Wisconsin. This over-all view of current research is organized by subject into the 26 chapters. ***Joseph R. Dillinger, editor.*** 676 pp. 1958. The University of Wisconsin Press, Madison. (QC278 In8p)

2171* Effective Range Expansion of the Scattering Matrix. The scattering matrix for the general N-channel reaction is diagonalized in the channel spin representation, and the eigenphase-shifts and elements of the diagonalizing matrix are expanded in a power series about an arbitrary energy. ***L. M. Delves.*** *Nuclear Physics,* v. 8, no. 3, Oct. 1958, p. 358-373.

2172* Heat Transfer in a Cross Flow Nuclear Reactor. Transfer between mutually perpendicular fuel and coolant channels of a nuclear reactor is studied for both isotropic and anisotropic conducting media by means of an electrical conduction analog. ***Charles L. Larson.*** *Nuclear Science and Engineering,* v. 4, Nov. 1958, p. 607-622.

2173* Phenomenological Theory of the S Matrix and T, C and P Invariance. II. Besides general discussion of various physical relations which follow from the T, C and TCP invariance requirements, the examples of $K\mu_3$ and hyperon decays are studied in detail. ***J. Werle.*** *Nuovo Cimento,* v. 9, ser. 10, no. 6, Sept. 16, 1958, p. 1091-1106.

2174 Characteristics of a Model Retinal Receptor Studied at Microwave Frequencies. A simplified microwave model of the human eye was constructed in order to study the characteristics of a model retinal receptor. The model receptor was a truncated cone of polystyrene-foam. This was fitted into a horn which transmitted the energy to a detection unit. The relative sensitivity of the model receptor was determined when it was irradiated by a point source and when it was placed at several different positions in a diffraction pattern at or near the Gaussian image point. The directional sensitivity was studied by pointing it in different directions. In addition, interaction effects between neighboring receptors were studied. ***Jay M. Enoch and Glenn A. Fry.*** *Optical Society of America, Journal,* v. 48, Dec. 1958, p. 899-911.

2175 Testing Low-Precision Optics. Bulk collectors of radiant energy (as distinguished from image-forming optical systems) can be tested for concentration of energy, uniformity of the concentration, and geometrical figure by comparing photographic transparencies exposed in the concentration region with similar transparencies exposed without using the concentrator. ***Edward Speyer.*** *Optical Society of America, Journal,* v. 8, Dec. 1958, p. 953-954.

2176 Design of Multilayer Filters by Successive Approximations. A relaxation method is used to adjust the thicknesses of the films of a multilayer in order to alter its transmission characteristics in a limited spectral region. This method is used to modify the spectral transmission of a short-wavelength pass multilayer and a broad-band dielectric mirror. The computations also furnish information useful in controlling the thicknesses of the layers in the fabrication of a multilayer. ***Philip Baumeister.*** *Optical Society of America, Journal,* v. 48, Dec. 1958, p. 955-958.

2177 Stokes' Equations and Their Application to the Refractivity of Thin Films. A solution to the problem of determining the refractivity of n identical planar arrays from the properties of a single array is obtained by first extending Stokes' equations to a form appropriate to a microscopic situation and then appropriately modifying Crook's results for thin films. The results of such development are found to be in agreement with data taken at microwave frequencies. ***A. F. Wickersham, Jr.*** *Optical Society of American, Journal,* v. 48, Dec. 1958, p. 958-964.

2178 Thermoluminescence Spectra of X-Ray Colored KCl Crystals. Spectra were recorded using a liquid-air cooled photomultiplier as detector. Glow peaks are shown to appear in pairs—a violet one (0.395 μ) and a blue one (at 0.44 μ)—repeated several times throughout the temperature range of 90-550 K. The phosphorescence at 90 K was found to be composed of three bands (at 0.51, 0.395, and about 0.28-0.35 μ). The 0.51-μ band shows two glow bursts on warming the crystal. ***A. Halperin and N. Kristianpoller.*** *Optical Society of America, Journal,* v. 8, Dec. 1958, p. 996-1000.

2179 Kamerlingh Onnes Conference on Low Temperature Physics at Leiden on 23-28 June 1958, Under the Auspices of the International Union of Pure and Applied Physics. More than 175 papers on low temperature physics have been presented to the Kamerlingh Onnes Conference. Only short summaries of the more than 150 contributed papers presented to the conference are published in these proceedings. *Physica* (Supplement), v. 24, Sept. 1958, 188 pp.

2180 Thermodynamic Properties of Argon at Temperatures Between 0°C and —140°C and at Densities up to 640 Amagat (Pressures up to 1050 atm.). From compressibility isotherms of argon published previously, values of energy, entropy, free energy, enthalpy, free enthalpy, internal kinetic energy, specific heats, speed of sound and Joule-Thomson coefficient have been calculated. The data are presented at integral values of density and of pressure. The values of the Joule-Thomson coefficient are compared with literature data. ***A. Michels, J. M. Levelt, and G. J. Wolkers.*** *Physica,* v. 24, Oct. 1958, p. 769-794.

2181 Magnetic Moments Due to Rotation in Li^6F and Li^7F. A molecular beam electric resonance spectrometer has been used to measure the Zeeman splitting of the hyperfine structure of Li^6F and Li^7F in the $J = 1$ rotational state. From these measurements the magnitudes of the rotational magnetic moments of the above molecules were determined. ***Allan M. Russell.*** *Physical Review,* v. 111, ser. 2, no. 6, Sept. 15, 1958, p. 1558-1567.

2182 Effects of Pressure on the Superconducting Transition Temperatures of Sn, In, Ta, Tl, and Hg. Solid parahydrogen has been used as a transmitter of approximately hydrostatic pressure to study the effects of pressures up to 10,000 atmos on the superconducting transition temperatures of polycrystalline, tin, indium, tantalum, thallium, and mercury. ***L. D. Jennings and C. A. Swenson.*** *Physical Review,* v. 112, ser. 2, no. 1, Oct. 1, 1958, p. 31-43.

2183 Theory of the Dielectric Constants of Alkali Halide Crystals. Simple classical theories of compressibility of ionic crystals lead to two relations among the experimental quantities from which arbitrary parameters have been eliminated, the Szigeti relations. ***B. G. Dick, Jr. and A. W. Overhauser.*** *Physical Review,* v. 112, ser. 2, no. 1, Oct. 1, 1958, p. 90-103.

2184 Internal Photoeffect and Exciton Diffusion in Cadmium and Zinc Sulfides. The spectral response of photoconductivity of ZnS and CdS for both single-crystal and sintered-powder samples was measured for several distances between the area of illumination and the electrode region. ***M. Balkanski and R. D. Waldron.*** *Physical Review,* v. 112, ser. 2, no. 1, Oct. 1, 1958, p. 123-135.

2185 On the Use of the Adiabatic Theory in Electron-Atom Collison Calculations. The adiabatic theory alloys for perturbation of the atom by treating the colloding electron as a fixed point charge. The form of the wave functions obtained may be shown to be correct in the limit of large separations. It is considered that the adiabatic theory over-estimates the

effect of perturbations of the atom for separations of order 1 atomic unit. The error introduced for the s-wave may be particularly large. ***V. M. Martin, M. J. Seaton, and J. B. G. Wallace.*** *Physical Society, Proceedings*, v. 72, Nov. 1958, p. 701-710.

2186 The Probability of Multiple Emissions of Secondary Electrons. Probabilities P_n have been determined for the emission of electrons in groups of n numbering from zero to eight occurring as a result of a single primary. For activated surfaces probabilities P_1 to P_8 show evidence of maxima in the energy range covered; P_7 and P_8 are still rising at the end of the range. For unactivated surfaces only P's for odd numbers of electrons show a clear decrease at higher energies; P's for even numbers of electrons, with the possible exception of P_2, are still rising at the end of the range. ***R. E. Barrington and J. M. Anderson.*** *Physical Society, Proceedings*, v. 72, Nov. 1958, p. 717-726.

2187* Anisotropy of Nuclear Magnetic Resonance Due to Crystal Dislocations. Using plastically deformed crystals of KI, the nuclear magnetic resonance of I^{127} has been observed. ***Eiso Otsuka.*** *Physical Society of Japan, Journal*, v. 13, Oct. 1958, p. 1155-1167.

2188* Disturbance Phenomena in Probe Measurement of Ionized Gases. This paper is concerned with disturbance phenomena occurring when a probe is immersed in plasma. ***Takayoshi Okuda and Kenzo Yamamoto.*** *Physical Society of Japan, Journal*, v. 13, Oct. 1958, p. 1212-1223.

2189 Some Optical and Magnetic Properties of Irradiated LiF. Experimental evidence is presented to indicate that F-centers are separated by more than six lattice units in the most densely colored samples. ***R. T. Bate and C. V. Heer.*** *Physics and Chemistry of Solids*, v. 7, no. 1, Oct. 1958, p. 14-21.

2190 The Quantum Theory of the High Frequency Surface Impedance of a Metal. A quantum-mechanical formula is derived for the high-frequency surface impedance of a metal in a constant magnetic field of arbitrary direction. No special assumptions are made about the dispersion law of the conduction electrons. It is shown that in general, the relative amplitude of the quantized resistance oscillations is considerably greater than at zero frequency. In principle, an experimental determination of the magnetic field dependence of the impedance would be sufficient to determine the shape of the Fermi surface and the velocities of the electrons thereon. ***M. Ya. Azbel'.*** *Physics and Chemistry of Solids*, v. 7, nos. 2/3, Nov. 1958, p. 105-107.

2191 Comparison of Radio-Copper and Hole Concentrations in Germanium. The changes in carrier concentration which occur when ^{64}Cu is introduced into p- and n-type Ge containing known concentrations of Ga and As was determined by resistivity measurements. The results for four different ^{64}Cu concentrations indicate the presence of three ionization levels. Although the precise positions of the levels cannot be determined, graphical solutions employing the level scheme of Woodbury and Tyler are shown to be reasonably consistent with the results. ***Katherine Wolfstirn and C. S. Fuller.*** *Physics and Chemistry of Solids*, v. 7, nos. 2/3, Nov. 1958, p. 141-145.

2192 Energy Transfer in ZnS:Cu:Cl Phosphors. The transfer of energy from blue to green emitting centers was studied. It appears that energy can be transported even at low temperatures and low impurity concentrations. An estimate of the energy transfer expected from a resonance process through electric dipole-dipole interaction, yields values for energy transfer which are much lower than these observed. Several possible transfer mechanisms are discussed. ***N. T. Melamed.*** *Physics and Chemistry of Solids*, v. 7, nos. 2/3, Nov. 1958, p. 146-152.

2193 Infrared Fluorescence of Copper-Activated Zinc Sulphide Phosphors. An infrared fluorescence was observed for ZnS:Cu, Al and ZnS:Cu, Ga at 1.57 μ and 1.72 μ. This emission appeared to be excited at low temperatures by radiation of 1.38 μ and between 0.5 μ and 0.8 μ, provided that the phosphor was excited by 3650 Å. The infrared quenching of the visible fluorescence and an infrared stimulation of the visible phosphorescence show a spectrum analogous to the infrared excitation spectrum, and seem to be connected with the same transitions. ***G. Meijer.*** *Physics and Chemistry of Solids*, v. 7, nos. 2/3, Nov. 1958, p. 153-158.

2194 The Antiferromagneticism of $CuCl_2 \cdot 2H_2O$. A simple explanation is given of the unusual behavior of $CuCl_2 \cdot 2H_2O$, which has a Néel temperature of 4.33 K but a broad maximum in the magnetic susceptibility at about 4.8 K. The explanation is based upon the fact that in $CuCl_2 \cdot 2H_2O$ the strongest interaction exists only in linear chains, and hence it is not as effective in determining the long-range order as it is in determining the short-range order. ***W. Marshall.*** *Physics and Chemistry of Solids*, v. 7, nos. 2/3, Nov. 1958, p. 159-164.

2195 Structure of the Metastable State of Mn^{++} and FE^{+++}. A discussion is presented of the possibility of performing spin-resonance experiments on various metastable excited states of ions of the configuration $(3d)^n$. There appears to be no reason why such experiments should not be feasible. A special study is made of the ions Mn^{++} and Fe^{+++} with configuration $3d^5$. Observations on the metastable levels of these ions would be particularly useful in understanding the splittings of the ground state ^6S. ***A. M. Clogston.*** *Physics and Chemistry of Solids*, v. 7, nos. 2/3, Nov. 1958, p. 201-206.

2196 Preparation and Electrical Properties of Mercury Telluride. Mercury telluride was prepared by direct reaction of Hg vapor with liquid Te. The compound was zone melted and annealed in Hg vapor under various pressures of Hg. It was found that the composition near stoichiometry could be altered by the anneal. Hall coefficient and resistivity were measured as a function of temperature. Analysis of the results gave 0.02 eV for the energy gap at 0°K and a hole to electron mobility ratio of 0.01. The Hall mobility was 17,000 cm^2/Vsec at 300 K and 25,000 cm^2Vsec at 143 K. ***T. C. Harman, M. J. Logan, and H. L. Goering.*** *Physics and Chemistry of Solids*, v. 7, nos. 2/3, Nov. 1958, p. 228-235.

2197 Absorption Spectrum of Arsenic Doped Silicon. The absorption spectrum of As doped Si was obtained and is in good agreement with that calculated from the effective mass theory. Bands which do not obey the calculated term scheme are shown to arise from other donor impurities. Optical and thermal ionization energies appear to be very similar for Group III and Group V impurities. ***Henry J. Hrostowski and R. H. Kaiser.*** *Physics and Chemistry of Solids*, v. 7, nos. 2/3, Nov. 1958, p. 236-239.

2198 Properties of Gases at Very High Temperatures. Known intermolecular force laws are used to calculate virial coefficients of the equation of state and the transport properties at very high temperatures for the rare gases and for molecular nitrogen. ***I. Amdur and E. A. Mason.*** *Physics of Fluids*, v. 1, no. 5, Sept.-Oct. 1958, p. 370-383.

2199 Experiments on Ion Cyclotron Resonance. Theoretical calculations indicate that an attractive possibility for heating the ions of a plasma directly, swiftly, and efficiently is to feed energy into ion cyclotron waves and cause this wave energy to thermalize. ***T. H. Stix and R. W. Palladino.*** *Physics of Fluids*, v. 1, no. 5, Sept.-Oct. 1958, p. 446-451.

2200* Theory of Complex Systems of Gyroscopic Stabilization. Consecutive application of the theorem of kinetic moment to the entire mechanical system and to its individual parts. Describes a corresponding method on a concrete example. (*In Russian.*) K teorii slozhnykh sistem giroskopicheskoĭ stabilizatsii. ***A. Iu. Ishlinskiĭ.*** *Prikladnaia Matematika i Mekhanika*, v. 22, no. 3, May-June, 1958, p. 359-373.

2201* Effects of Defects on Lattice Vibrations—Thermodynamical Properties. An attempt is given for calculating the thermodynamical quantities with respect to the vibrational frequencies of the imperfect lattices. Using the method of contour integral the expressions for the difference of vibrational free energies between imperfect and perfect lattices are derived. These are given in two forms available at high and at low temperatures. ***Kaoru Yamahuzi and Tomoyasu Tanaka.*** *Progress of Theoretical Physics*, v. 20, no. 3, Sept. 1958, p. 327-355.

2202 Determination of the Magnetic Anisotropy of Single Crystals From Magnetic Torques Measured With Quartz Fibers. The method of investigating the magnetic anisotropy of single crystals by observing the torque exerted on a crystal

by a homogeneous magnetic field was found to be subject to several sources of error which were of particular importance when small differences of susceptibility were involved. Several changes in design of the equipment and in the experimental procedure have been introduced, resulting in a great improvement in the reproducibility of the measurements; these changes included the introduction of effective draft shielding, the use of high magnetic fields to saturate ferromagnetic impurities, and the use of a graphical method of data analysis. ***Derek A. Gordon.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 929-934.

2203 Electron-Bombardment Detection of Noncondensable Molecular Beams. An electron-bombardment detector developed for the detection of noncondensable as well as condensable molecular beams is described. The ionization efficiency for a hydrogen deuteride beam is in the range of 10^{-5} to 10^{-4}. Auxiliary components include: vacuum buffer chambers for source background gas reduction; a mass spectrometer for ion mass selection; an electron multiplier, electrometer, and phase-sensitive detector combination for signal observations. Modulation techniques for beam and magnetic resonance detection are discussed. ***W. E. Quinn, et al.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 935-943.

2204 Second-Order Properties of Double-Focusing Spectrometer With Nonuniform Magnetic Field. Second-order focusing properties are considered for a nonuniform magnetic field with arbitrary circular boundaries in the case of normal entry and exit. The formula obtained here agrees with that obtained by Hintenberger for the special case $\alpha = \beta = 0$. It is also shown that the double and second-order focusing can be achieved simultaneously. The numerical results are represented graphically for a symmetrical double-focusing spectrometer with an arbitrary deflection angle. ***Hidetsugu Ikegami.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 943-948.

2205 Alternate Current Apparatus for Measuring the Ordinary Hall Coefficient of Ferromagnetic Metals and Semiconductors. An alternating electric field at 1000 cps is used with a static magnetic field. The apparatus has a sensitivity of 10^{-13} watt, a noise level of 10^{-9} volt, and a voltage resolution of one part in 10^5. The sample holders are described. ***Jerome M. Lavine.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 970-976.

2206 Portable Magnetic Field and Gradient Meter. A portable instrument for measuring magnetic fields and field gradients is described. The measurements depend on comparing the alternating emf's induced in two search coils oscillated synchronously at about 3 cps through angles of less than 3°, one in the field to be measured and the other in the reference field of a permanent magnet in the instrument. A precision Helipot is used as a potentiometer, in which a measured fraction of the signal from the reference coil is balanced against the signal from the probe coil. The null is obtained through an electronic amplifier and galvanometer. ***W. C. Thoburn.*** *Review of Scientific Instruments*, v. 29, Nov. 1958, p. 990-992.

2207 Notes on Magneto-Hydrodynamics. VIII. Nonlinear Wave Motion. Aim is to emphasize the remarkably close parallelism between this theory and ordinary gas dynamics. ***K. O. Friedrichs and H. Kranzer.*** *U. S. Atomic Energy Commission, NYO-6486*, July 31, 1958, 61 pp. (UF767 U3ny Contin.)

2208 Measurement of Electron Flux in Media Bombarded by X-Rays. Energy distribution of flux generated by lightly filtered 250 KVCP X-rays has been determined for media consisting of pairs of parallel plates made of copper, aluminum or graphite. ***D. R. Nelson, R. D. Birkhoff, R. H. Ritchie, and H. H. Hubbell, Jr.*** *U. S. Atomic Energy Commission, ORNL-2521*, Oct. 29, 1958, 102 pp. (UF767 U3o Contin.)

2209 External Conductivity Theory of Stabilized Pinch Formation. The sharpness of the boundary layer is seen to be limited by two entirely independent factors: the resistive diffusion process, and the programming of magnetic field boundary values at the insulating wall. A mathematical method is developed to describe the entrapment and compression of magnetic field distributions in infinite conductivity plasma. ***S. A. Colgate, J. P. Ferguson, and H. P. Furth.*** *U. S. Atomic Energy Commission, UCRL-5086*, Jan. 16, 1958, 17 pp. (UF767 U3u Contin.)

2210 Energy Loss and Range of Electrons and Positrons. Tabulations of the mean energy loss due to ionization and excitation and the range derived from this quantity are given for electrons and positrons in several materials. ***Ann T. Nelms.*** *U. S. National Bureau of Standards, NBS Circular 577*, July 26, 1956, 30 pp. Suppl., July 30, 1958, 31 pp. (T21 Un3c Contin.)

2211* A Formal Treatment of the Consequences of the Second Law of Thermodynamics in Carathéodory's Formulation. The consequences of the above are developed by means of a largely formal argument. The need for the introduction of the Theorem of Carathéodory does not arise. ***H. A. Buchdahl.*** *Zeitschrift für Physik*, v. 152, no. 4, 1958, p. 425-439.

2212* Diffraction of Light by Weak Ultrasonic Fields. Expressions obtained are found to be identical with those of David, and Bhatia and Noble. Extending this treatment to the case of diffraction by stationary waves it is shown that the intensity of a first order in this case is half that of the corresponding order for progressive waves and this result has also been verified experimentally. ***B. Ramachandra Rao and J. Satyanarayana Murty.*** *Zeitschrift für Physik*, v. 152, no. 4, 1958, p. 440-447.

2213* On the Theory of the Optical Properties of Conductors in the Case of Oblique Incidence of the Radiation. A microscopic theory of the optical properties of conductors is presented for the case when the mean free path of the electrons is not small compared with the characteristic distance of variation of the electromagnetic field. (*In Russian.*) K teorii opticheskikh svoĭstv provodnikov dlia sluchaia naklonnogo padeniia izlucheniia. ***V. P. Silin.*** Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki, v. 35, no. 4, Oct. 1958, p. 1001-1004.

See also: **1284** (piezoelectric ceramics); **1910** (superconducting transition in Ta).

PLASTICS

2214* The Mechanism of Polymerization of Acetylene. The yield of this reversible reaction is in direct proportion to the dissolved acetylene bound in the complex. (*In Russian.*) K voprosu o mekhanizme polimerizatsii atsetilena. ***S. A. Vartanian, S. K. Pirenian, and G. A. Musakhanian.*** *Akademiia Nauk Armianskoĭ SSR, Doklady*, v. 27, no. 2, 1958, p. 81-85.

2215* Production of Grafted Copolymers of Polyamides With Vinyl Monomers. Change of the mechanical properties of capron or of amide specimens after ozonization and polymerization with styrene. Modification of the specific viscosity and the elementary composition of polyamide specimens. Formation of polystyrene or polymethyl methacrylate layer. (*In Russian.*) O poluchenii privitykh copolimerov poliamidov s vinil'nymi monomerami. ***V. V. Korshak, K. K. Mozgova, and M. A. Shkolina.*** *Akademiia Nauk SSSR, Doklady*, v. 122, no. 4, Oct. 1, 1958, p. 609-611.

2216 The Branching Reaction. II. Styrene and Methyl Methacrylate. A study was carried out to determine the transfer constants of polystyrene and poly-(methyl methacrylate) in the homopolymerization and graft copolymerization of styrene and methyl methacrylate. This was accomplished by polymerizing the monomers in the presence of varying amounts of the oligomers, and carefully separating the resulting polymers. ***Maurice Morton and Irja Piirma.*** *American Chemical Society, Journal*, v. 80, Nov. 5, 1958, p. 5596-5602.

2217 Mechanism Studies of Isoprene Polymerization With the Aluminum Triisobutyl-Titanium Tetrachloride Catalyst. Analysis of the catalyst complex formed on mixing aluminum triisobutyl and $TiCl_4$ indicates that practically all the Ti is in the solid precipitate in a reduced valence state. As the amount of Al alkyl used increases, the solid changes from a brown $TiCl_3$ by a partial substitution of Cl by alkyl groups. The rate of isoprene polymerization is strongly dependent on the Al/Ti

mole ratio. ***William M. Saltman, William E. Gibbs, and Joginder Lal.*** *American Chemical Society, Journal*, v. 80, Nov. 5, 1958, p. 5615-5622.

2218* Acrylics in Textile Binding Applications. Three textile applications of acrylic polymers: bonding on nonwovens, back-coating, and pigment binding. ***A. C. Nuessle, C. E. Hoey, and J. Kucsan.*** *American Dyestuff Reporter*, v. 47, no. 22, Nov. 3, 1958, p. P765-P771.

2219* Kinetics of the Inhibition of the Thermal Polymerization of Styrene. I. Kinetics of the One-Step Inhibition. II. Mechanism of the Two-Step Inhibition. III. Kinetics of the Copolymerization of the Inhibitor. IV. Thermal Polymerization of Styrene Inhibited by Quinones. V. Mechanism of the Effect of Stable Free Radicals. (*In German.*) Kinetik der Inhibition der thermischen Styrolpolymerisation. I. Kinetik der in einer Stufe verlaufenden Inhibition. II. Mechanismus der in zwei Stufen verlaufenden Inhibition. III. Kinetik der Kopolymerisation des Inhibitors. ***F. Tüdos and N. I. Smirnow.*** IV. Die mit Chinonen inhibierte thermische Styrolpolymerisation. V. Wirkungsmechanismus der stabilen freien Radikale. ***F. Tüdos and V. Fürst.*** *Acta Chimica Academiae Scientiarum Hungaricae*, v. 15, no. 4, 1958, p. 389-448.

2220 Plasticizer Properties of Some Acrylonitrile-Eleostearate Adducts and Their Hydrogenated Derivatives. Optimum conditions were established for the hydrogenation of the ethylenic bonds of the acrylonitrile adducts with minimum reduction of the nitrile group. The plasticizing properties of the hydrogenated derivatives were determined. ***Lida L. Placek, R. R. Mod, Frank C. Magne, and W. G. Bickford.*** *American Oil Chemists' Society, Journal*, v. 35, Nov. 1958, p. 584-586.

2221 Plasticizers for P.V.C. Plastisols. Behavior of various types of plasticizers when incorporated in p.v.c. plastisols. ***D. S. Newton and J. A. Cronin.*** *British Plastics*, v. 31, Oct. 1958, p. 426 + 6 pages.

2222 The Effect of Heat on the Mechanical Properties of Certain Glass Fabric Filled Laminates. Maximum continuous-operation temperature ranges are recommended for phenolic, polyester, epoxide, melamine, and silicone resins. ***W. J. Read.*** *British Plastics*, v. 31, Oct. 1958, p. 432-437.

2223 Graft and Block Polymerization. Possible polymer arrangements which can be obtained using two different monomers via graft and block polymerization. ***C. G. Overberger and Arthur Katchman.*** *Chemical and Engineering News*, v. 36, no. 45, Nov. 10, 1958, p. 80-85.

2224 The Kinetics of Catalytic Polymerisations. XI. Polymerisation of α-Methylstyrene Catalysed by the Chloracetic Acids. XII. Heat and Mechanism of Polymerisation of α-Methylstyrene Catalysed by the Chloroacetic Acids. *C. P. Brown and A. R. Mathieson.* *Chemical Society, Journal*, 1958, Oct., p. 3445-3454, p. 3507-3513.

2225* Isotactic Polymers of Silicon-Containing Vinyl Monomers. Using the catalytic systems active for the stereospecific polymerization of α-olefins, high molecular weight linear polymers of silicon-containing vinyl monomers have been prepared. (*In Italian.*) Polimeri isotattici di monomeri vinilici contenenti silicio. ***G. Natta, G. Mazzanti, P. Longi, and F. Bernardini.*** *Chimica e l'Industria*, v. 40, Oct. 1958, p. 813-815.

2226* Ethylene Polymerization With Soluble Catalysts. The polymerization of ethylene to high linear polymers by means of catalysts soluble in hydrocarbons, obtained from compounds of transition metals and metalorganic compounds such as Ti tetraalcoholates and Al trialkyls, was studied. (*In Italian.*) Polimerizzazione dell'etilene con catalizzatori solubili. ***M. Farina and M. Ragazzini.*** *Chimica e l'Industria*, v. 40, Oct. 1958, p. 816-819.

2227* The Chlorofluorine Polymers and Their Derivatives. I. Generics and Properties. (*In French.*) Les polymères chlorofluorés et leurs dérivés. I. Généralités-Propriétés. ***M. Vaillant.*** *Chimie & Industrie*, v. 80, no. 4, Oct. 1958, p. 429-436.

2228 Epoxy Resins. Epoxy resins are described as casting and potting compounds, adhesives, and plasticizers. Explains both the "how" and "why" of epoxy uses. ***Irving Skeist and George R. Somerville.*** 293 pp. 1958. Reinhold, New York. (TP986.E6 SK25e)

2229 Furfurylated Novolak Resins. Reaction products of furfuryl alcohol and novolaks, and evaluation of their end products. ***L. H. Brown, D. D. Watson, and K. J. Siegfried.*** *Industrial and Engineering Chemistry*, v. 50, Nov. 1958, p. 1675-1676.

2230 Dielectric Dispersion in Methacrylate Polymers and Its Correlation With Mechanical Properties. Dielectric measurements on ethyl, *n*-butyl, *n*-hexyl, and *n*-octyl methacrylate polymers. ***John D. Ferry and Stephen Strella.*** *Journal of Colloid Science*, v. 13, no. 5, Oct. 1958, p. 459-471.

2231 Copolymers of Anthracene With Styrene and *p*-Chlorostyrene. In addition, 2-chloroanthracene was copolymerized with styrene. ***C. S. Marvel and B. D. Wilson.*** *Journal of Organic Chemistry*, v. 23, Oct. 1958, p. 1479-1482.

2232 Wetting of Polymer Surfaces. I. Contact Angles of Liquids on Starch, Amylose, Amylopectin, Cellulose, and Polyvinyl Alcohol. *B. Roger Ray, J. R. Anderson, and J. J. Scholz.* *Journal of Physical Chemistry*, v. 62, Oct. 1958, p. 1220-1227.

2233* Response of Linear High Polymers to Hydrostatic Pressure. The bulk compressibility of linear high polymers has been found to be a function of temperature, pressure, and time. Linear high polymer melts are highly compressible. The effects of the bulk compressibility on the fabrication condition of plastics as well as product properties are discussed. ***Shiro Matsuoka and Bryce Maxwell.*** *Journal of Polymer Science*, v. 32, Oct. 1958, p. 131-159.

2234* Resins Based on Unsaturated Hydrocarbons (Coumarone and Indene). Developments and Characterization by Infra Red Spectroscopy. Data on the composition of the benzene solution used for the polymerization of these resins were obtained by IR spectroscopy. (*In German.*) Zur Entwicklung der Cumaron- und Gebaganharze und ihre Analyse mit Hilfe der IR-Spektroskopie. ***W. Brause and H. -O. Heinze.*** *Kautschuk und Gummi*, v. 11, Sept. 1958, p. 260WT + 2 pages.

2235* Notes on Torsional Oscillation Method for Measuring the Rheological Properties of Polymer Films and Coatings. *Yukihiko Inoue and Yonosuke Kobatake.* *Kolloid-Zeitschrift*, v. 160, no. 1, Sept. 1958, p. 44-48.

2236* The Synthesis of Branched Chain Polyvinyl Acetates. A mode of synthesis of well characterized branched polyvinyl acetate is described. This method has the distinct advantage that both constituents of the branched polymer can be fractionated prior to the grafting process (condensation). ***H. W. Melville, F. W. Peaker, and R. L. Vale.*** *Makromolekulare Chemie*, v. 28, no. 2, Oct. 1958, p. 140-165.

2237 Now You Can Specify Plastics Pressures Vessels. Describes common types and materials, how to design them, how they compare with metal vessels, and where they are used. ***Arthur J. Wiltshire.*** *Materials in Design Engineering*, v. 48, Nov. 1958, p. 101-104.

2238 Sheet Formed Plastics Parts. Advantages, types, materials, forming methods, and design limitations. ***Jack C. Merriam.*** *Materials in Design Engineering*, v. 48, Nov. 1958, p. 121-136.

2239* A New Polyester Film. Videne A and Videne TC are described. Both are made from the same basic resin but have many unlike characteristics. ***Paul J. Vaughan.*** *Package Engineering*, v. 3, Nov. 1958, p. 27-31.

2240 Best Recipe for Casting Urethane Foam. ***Harry Gerstin.*** *Product Engineering*, v. 29, no. 46, Nov. 10, 1958, p. 86-88.

2241* Improving Electrical Properties of Epoxides. The variation in electrical properties of a reaction product of bisphenol A and epichlorohydrin are determined with respect to percentage of curing agent, the chemical structure of the curing agent, and the deleterious effects of water and heat. ***John Delmonte and Kenneth Cressey.*** *SPE Journal*, v. 14, Nov. 1958, p. 29-32.

2242* Low Temperature Properties of Plastics Foams. A preliminary investigation indicates that the tensile strength of foam plastics in cryogenic applications may be dependent on the dimensions and orientation of the built-in notches formed by the cell walls. ***R. M. McClintock.*** *SPE Journal*, v. 14, Nov. 1958, p. 36-38.

2243* Studying the Electrical Properties of Casting Resins. Continuous current monitoring instrumentation together with several sample cells is described. Instrumentation graphically records the changes in conductivity of a resin throughout the polymerization process. ***R. W. Warfield.*** *SPE Journal*, v. 14, Nov. 1958, p. 39 + 6 pages.

2244 Branching Reactions in the Polymerization of Vinyl Acetate. A study to determine the transfer constants of poly(methyl acrylate) and poly(vinyl acetate) in their respective homopolymerizations, as well as in graft copolymerizations. Method used was the polymerization of the monomers in the presence of varying amounts of oligomers, followed by careful separation of the resulting polymers. ***Maurice Morton and Irja Piirma.*** *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 58-119, Mar. 1958, 25 pp. (TL507 Un3.18w Vis.)

2245* A Short Survey of Works on Isotactic Polymers. Obtaining of stereoregular polymers. Mechanisms and kinetics of stereospecific polymerization. Characteristics of isotactic polypropylene, polybutene, polystyrene, stereoisomeric polymers of diolefins, polyvinyl chloride, copolymers of α-olefins and block polymers. Synthesis and properties of highly crystalline α-olefins with branched chains. Polymerization of acetylene. (*In Russian.*) Kratkii obzor rabot po izotakticheskim polimeram. ***E. S. Krongauz and A. P. Suprun.*** *Uspekhi Khimii*, v. 27, no. 9, Sept. 1958, p. 1056-1083.

2246* Catalytic Copolymerization of Unsaturated Compounds. II. The Copolymerization of Isoprene and α-Methylstyrene. Three components participate in the growth reaction: isoprene, α-methylstyrene, and the copolymer with internal double bonds. A steric effect on the reaction has been established when a tertiary carbonium ion within the chain reacts with the monomers. Concludes that α-methylstyrene is a considerably more reactive monomer than isoprene. (*In Russian.*) Sovmestnaia kataliticheskaia polimerizatsiia nenas'shchennykh soedinenii. II. Sovmestnaia polimerizatsiia izoprena s α-metilstirolom. ***T. E. Lipatova, A. R. Gantmakher, and S. S. Medvedev.*** *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 9, Sept. 1958, p. 2029-2034.

2247* Polymerization of Chlorine Derivatives of Styrene and Their Copolymerization With Vinyl Chloride. α,β,β-Trichlorostyrene does not form high molecular products under the influence of either free radicals or Friedel-Crafts catalysts. β,β-Dichlorostyrene polymerizes only according to the cationic mechanism. The rate of copolymerization with vinyl chloride decreases on increase in content of the chlorostyrenes and when the content exceeds 0.5 molar fractions low molecular compounds are formed. (*In Russian.*) Polimerizatsiia khlorproizvodnykh stirola i ikh sovmestnaia polimerizatsiia s khloristym vinilom. ***G. V. Tkachenko, L. V. Stupen', V. S. Etlis, and L. P. Kofman.*** *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 10, Oct. 1958, p. 2251-2255.

See also: **1347** (epoxy resin spot test); **1349** (analysis of polymers); **1422** (vinyl acetate polymerization); **1443** (use of nuclear radiation); **2350** (welding of PVC sheets).

POLLUTION AND WASTES

2248 Combustibility of Simulated Automobile Exhaust Gases. The mixtures tested covered a wide range of burnable and nonburnable compositions, based on mass spectrometer analyses of actual automobile exhausts reported in the available literature. Equations and a correlation curve are presented, which enable the flammability of an automobile exhaust to be predicted from a knowledge of its composition and temperature. ***Bernard Greifer and Raymond Friedman.*** *Air Pollution Foundation, Report No.* 25, Sept. 1958, 38 pp. (TD884 Ai71.3r Vis.)

2249 Air Pollution Effects of Irradiated Automobile Exhaust as Related to Fuel Composition. "Photochemical smog" was produced by irradiating diluted automobile exhaust in a 520-cubic foot chamber. The intensity of this smog was measured in terms of the resulting symptoms of eye irritation, visibility reduction, and ozone formation. Under certain conditions exhausts from all fuels led to appreciable eye irritation, and in these cases the olefin-containing fuels led to more reactive exhausts and more eye irritation than the non-olefinic fuels. Good correlations were found between eye irritation and the concentrations of certain C_4 and C_5 olefins in the exhaust, while other hydrocarbons did not show such correlations. The quantity of aerosol formed by irradiating the various exhausts was found to be dependent on both the olefin content and the sulfur content of the fuel. The maximum concentrations of ozone formed by irradiation of diluted exhaust were essentially independent of fuel composition. ***E. A. Schuck, H. W. Ford, and E. R. Stephens.*** *Air Pollution Foundation, Report No.* 26, Oct. 1958, 91 pp. (TD884 Ai71.3r Vis.)

2250* The Relationship Between Sulfur Dioxide and Particulate Matter in the Atmosphere. Describes the features and the patterns of occurrence of two pollutants, as they have been observed in Cincinnati since 1946. ***J. Cholak, L. J. Schafer, W. J. Younker, and D. W. Yeager.*** *American Industrial Hygiene Association Journal*, v. 19, no. 5, Oct. 1958, p. 371-377.

2251* Dispersion of Radioactive Materials by Streams. The chemical and physical properties of radioactive materials that can influence their dispersion in streams include state, mass, density, radioactive lifetime, chemical state, and the temperature of the effluent that bears them. The biota of a stream can significantly affect the dispersion of radioactive contamination by accumulating and retaining certain radioisotopes, and by spreading the contamination through migration. ***Jared J. Davis.*** *American Water Works Association, Journal*, v. 50, Nov. 1958, p. 1505-1515.

2252* Clean Air and the Foundry Industry. Methods for dealing with emissions and effluents. ***H. T. Angus.*** *B.C.I.R.A. Journal of Research and Development*, v. 7, no. 8, Oct. 1958, p. 325-329.

2253* Air Pollution From Tall Chimneys. A nomographic method of calculating ground-level pollution from an elevated point source. ***W. Strauss and G. Woodhouse.*** *British Chemical Engineering*, v. 3, Nov. 1958, p. 620-622.

2254* A New Economic Method for Sludge Dewatering. (*In German.*) Eine neue Wirtschaftliche Schlammentwässerung. ***Friedrich Kiess and Carl Schreckegast.*** *GWF; Gas- und Wasserfach* (Wasser Abwasser), v. 99, no. 44, Oct. 31, 1958, p. 1121-1124.

2255 Atmospheric Diffusion of Air Pollutants. Analog Computer Study. Operating speed and ease of adjusting parameter settings make analog computer simulation ideally suited for the study of air pollution. A two-dimensional system is discussed, but by cascading a sufficient number of simple computer units, a three-dimensional system may be simulated as well. ***Walter J. Karplus, George A. Bekey, and Paul J. Pekrul.*** *Industrial and Engineering Chemistry*, v. 50, Nov. 1958, p. 1657-1660.

See also: **1332** (atmospheric SO_2).

RUBBER AND ELASTOMERS

2256* Catalytic Solidification of Polydimethylsiloxane at Room Temperature. A study of the variation of the shear stress and the recovery during vulcanization of a silico-organic polymer under the effect of a tin organic compound (0.7%) or of a butyl titanate (3%). Properties of the vulcanizates produced at 20 C during 24 hours. Rate of vulcanization as a function of the molecular weight of the polymer and of the nature of the catalyst. (*In Russian.*) Kataliticheskoe otverzhdenie polidimetilsiloksana pri komnatnoĭ temperature. ***N. B. Baranovskaia, M. Z. Zakharova, A. I. Mizikin, and A. A. Berlin.*** *Akademiia Nauk SSSR, Doklady*, v. 122, no. 4, Oct .1, 1958, p. 603-606.

2257 Viscosity-Equilibrium Swelling Correlations for Natural Rubber. A correlation is sought betwen the limiting viscosity numbers of a rubber sample in 21 solvents, and the equilibrium swellings of a cross-linked network of the rubber in the same solvents. ***G. M. Bristow and W. F. Watson.*** *Faraday Society, Transactions*, v. 54, Oct. 1958, p. 1567-1573.

2258 Search for High Temperature Elastomer. Fluorinated acrylic elastomers, fluorinated silicone rubber, polyester rubber, and fluorocarbon elastomers are briefly discussed. ***William Postelnek.*** *Industrial and Engineering Chemistry*, v. 50, Nov. 1958, p. 1602-1607.

2259* Ageing of Natural Rubber Vulcanisates in the Presence of Dithiocarbamates. The thermal and photochemical ageing of extracted dicumyl peroxide-, TMT (sulfurless)-, and Santocure-vulcanized rubber, in presence of a number of metal and alkylammonium dithiocarbamates, was investigated by measurements of stress relaxation. ***J. R. Dunn and J. Scanlan.*** *Institution of the Rubber Industry, Transactions*, v. 34, no. 5, Oct. 1958, p. 228-236.

2260* On the Oxidation Mechanism of Rubbers in the Presence of Inhibitors. The hydrocarbon of Na-butadiene rubber was the objective. Films 0.15-0.25 mm. thick were studied. Phenyl-β-naphthylamine, was chosen as the inhibitor for use in the experiments. ***L. G. Angert and A. S. Kuzminskii.*** *Journal of Polymer Science*, v. 32, Oct. 1958, p. 1-25.

2261* Dependence of the Ultimate Properties of a GR-S Rubber on Strain Rate and Temperature. The tensile properties of an unfilled GR-S rubber were measured at strain rates between 0.158×10^{-8} and 0.158 $sec.^{-1}$ at temperatures between –67.8 and 93.3 C. ***Thor L. Smith.*** *Journal of Polymer Science*, v. 32, Oct. 1958, p. 99-113.

2262* Viton A, a Fluorinated Elastomer. Viton A is a vinylidene fluoride-hexafluoropropyl-copolymer with very high resistance to heat and chemicals, due to the presence of 65% fluorine. Specific weight of the raw material 1:85; good storage properties and workability under cold rolling. Vulcanization mechanism. Effect of carbon black filling on physical properties of Viton A vulcanizates. (*In German.*) Viton A, ein fluorhaltiges Elastomer. ***Tibor Gábris.*** *Kautschuk und Gummi*, v. 11, Sept. 1958, p. 242WT-244WT.

2263* Polyisoprene and Polybutadiene. A study of isoprene and butadiene polymerization with $Al(C_2H_5)_3 + TiCl_4$, and of butadiene polymerization with $Al(iC_4H_9)_3 + TiCl_4$ o rat 5 C with $Al(C_2H_5)_3 + TiBr_4$ or with $Al(iC_4H_9)_3 + TiBr_4$. Physical properties of non-vulcanized polybutadienes and comparison with emulsion polymerizates. (*In German.*) Über Polyisopren und Polybutadien. ***Walter Franke.*** *Kautschuk und Gummi*, v. 11, Sept. 1958, p. 254WT + 3 pages.

2264* The Formation in the Plastication of Natural Rubber of a Gel and Its Effect on the Strength of Vulcanizates. In plastication the molecular weight of the soluble fraction increases, the viscosity and the Hoggins constants decrease. The tensile strength of non-filled S rubbers containing the microgel is equal to that of vulcanizates from non-crystallizing polymers. (*In Russian.*) Obrazovanie gelia pri plastikatsii natural'nogo kauchuka i ego vliianie na prochnost' vulkanizatov. ***B. A. Dogadkin and V. N. Kulezner.*** *Kolloidnyi Zhurnal*, v. 20, no. 5, Sept.-Oct. 1958, p. 674-675.

2265 Take a Look at *cis*-Polybutadiene. The future of polybutadiene rubbers can be assured by new developments in solution polymerization and organometallic catalysis. ***W. W. Crouch and G. R. Kahle.*** *Petroleum Refiner*, v. 37, Nov. 1958, p. 187-194.

2266* Determining Discoloration of Rubberlike Films by Reflectance Spectrometry. Method is consistent with visual observations and has the advantage that the effects may be quantitatively described and recorded for later use. The importance of using the complete spectral reflectance curve for use in interpretation of discoloration phenomena is emphasized. ***James T. Hill and Fred Leonard.*** *Rubber Age*, v. 84, no. 2, Nov. 1958, p. 268-274.

2267* Aeration of Natural Rubber Latex. I. Effect of Polyamines on the Hardness and Aging Characteristics of Aerated Latex Rubber. II. Graft Polymerization of Vinyl Monomers With Aerated Latex Rubber. Absorption of oxygen by ammoniated latex at room temperatures creates reactive groups on the rubber hydrocarbon. Alkylene polyamines crosslink rubber in latex and enhance the aging properties. ***B. C. Sekhar.*** *Rubber Chemistry and Technology*, v. 31, no. 3, July-Sept. 1958, p. 425-435.

2268* Melting and Glass Transitions in Polyisobutylene. An investigation of the crystallization behavior of uncompounded, unstressed polyisobutylene and butyl rubber. Glass transition data obtained are also reported. The data were determined dilatometrically. ***R. M. Kell, Bailey Bennett, and P. B. Stickney.*** *Rubber Chemistry and Technology*, v. 31, no. 3, July-Sept. 1958, p. 499-504.

2269* Changes in the Specific Volume of Rubber During Elongation. An increase in volume under strain, which reaches 2% at the maximum elongations, is observed in both loaded and unloaded stocks based on different rubbers. Curves of specific volume versus elongation are characteristically S-shaped. Natural rubber stocks show a drop in volume, related to the crystallization of the rubber, until a certain elongation is reached; the higher the state of cure, the higher this elongation. ***A. B. Kusov, V. I. Trofimova, and Yu. I. Nilova.*** *Rubber Chemistry and Technology*, v. 31, no. 3, July-Sept. 1958, p. 513-518. (Translated from *Kolloidnyi Zhurnal*, v. 19, 1957, p. 587-591.)

2270* The Role of Metal Oxides as Activators of Vulcanization. Comparative study of the activating effect and properties of the oxides of a number of metals as a function of the type of rubber, the vulcanization accelerator and the active fillers. The compounds studied were ZnO, MgO, CaO, and $Ca(OH)_2$. ***M. Feldstein, P. Orlovsky, and B. Dogadkin.*** *Rubber Chemistry and Technology*, v. 31, no. 3, July-Sept. 1958, p. 526-538. (Translated from *Kauchuk i Rezina*, no. 1, 1957, p. 22-31.)

2271* Organic Sulfides and Polysulfides. I. Desulfurization Reactions. II. Reactions With Hydrazine, Ethylenediamine, and Ammonia. III. Reactions With Amines. IV. Reactions With Doctor Solution, Silver Nitrate, Cupric Acetate and Lead Acetate. V. Reactions With Methyl Iodide. VI. Reactions of Metallic Oxides With Polysulfide Rubbers. ***Yuji Minoura.*** *Rubber Chemistry and Technology*, v. 31, no. 3, July-Sept. 1958, p. 608-630. (Translated from the *Journal of the Society of the Rubber Industry of Japan*, v. 23, 1950, p. 212-215.)

2272* Changes in the Electrical Properties of Natural Rubber/Carbon Black Compounds During Vulcanization. Advantages of direct current or low frequency measurement of the electrical properties of natural rubber compounds, when operating inside the mold in which vulcanization is occurring. ***H. Desanges, R. Chasset, and P. Thirion.*** *Rubber Chemistry and Technology*, v. 31, no. 3, July-Sept. 1958, p. 631-649. (*Reprinted from the Revue Générale du Caoutchouc*, v. 34, no. 12, Dec. 1957, p. 1260-1267.)

2273* Tire Abrasion at Different Temperatures. The relative abrasion resistance of tire treads of various types was determined by relatively short but statistically reliable standard tests, with automobiles driven on streets. The dependence on temperature of the abrasion for SBR is markedly less than for natural rubber. ***C. J. Van Amerongen, J. F. Benders, and H. C. J. De Decker.*** *Rubber Chemistry and Technology*, v. 31, no. 3, July-Sept. 1958, p. 650-654. (Translated from *Kautschuk und Gummi*, v. 10, no. 8, Aug. 1957, p. WT204 + 2 pages.)

2274 Heat Resistant Natural Rubber Stocks Vulcanized at Low Temperatures. The use of thiourea or certain dialkyl thioureas as vulcanization accelerators. ***W. P. Fletcher and S. G. Fogg.*** *Rubber Journal and International Plastics*, v. 135, no. 18, Nov. 1, 1958, p. 687 + 1 page.

2275* Odd Electrons in Rubber Reinforcing Carbon Blacks. Rubber-grade carbon blacks contain appreciable concentrations of unpaired electrons, which appear to be reactive towards rubber. ***Gerard Kraus and R. L. Collins.*** *Rubber World*, v. 139, no. 2, Nov. 1958, p. 219-226.

2276* The Influence of Particle Size on the Viscosity of Synthetic Latex. II. The Effect of Particle Spacing. From the simple geometric considerations of particle size and mean particle spacing, a relation between particle sizes in synthetic latices and the concentration limited by viscosity has been deduced and substantially monodisperse systems. ***Robert H. Kelsey and Paul H. Johnson.*** *Rubber World*, v. 139, no. 2, Nov. 1958, p. 227-231.

2277 The Effects of Gamma Irradiation on Acrylonitrile-Butadiene Copolymers. Changes in the chemical and physical properties produced by the irradiation of a series of acrylonitrile-butadiene copolymers varying in composition from 20 to 50% acrylonitrile with gamma photons were measured and correlated with the nature of the copolymer, initial type of cure (sulfur peroxide, or radiation), and the total integrated dose. ***John A. Parker, Freeman F. Bentley, E. A. Peterson, and Denver Hale.*** *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 57-78, Sept. 1958, 98 pp. (TL507 Un3.18w Vis.)

2278* The Vulcanization and Mechanical Properties of Ebonites. Changes in strength, "equilibrium" modulus, relaxation rate, thermodynamic properties during the vulcanization process under different conditions were investigated. (*In Russian.*) *Vulkanizatsiia i mekhanicheskie svoistva ebonitov.* **A. S. Kuz'minskii and L. V. Borkova.** *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 9, Sept. 1958, p. 2051-2060.

SPACE HEATING AND CONDITIONING

2279 Temperature Distribution in Fins and Other Projections, Including Those of Building Structures, by Several Procedures. Analysis of temperature variations and heat-flow rates. ***C. F. Kayan and R. G. Gates.*** *ASME, Transactions*, v. 80, no. 8, Nov. 1958, p. 1599-1608.

2280* For Multi-Room Air Conditioning—Which System Is Best? Of eight schemes considered, the fan-coil-primary air system stands well above other systems. ***W. R. Barnard.*** *Air Conditioning, Heating, and Ventilating*, v. 55, Nov. 1958, p. 59-64.

2281* Refrigerants. Explains the various refrigerants commonly used, how one differs from the other, and desirable properties in refrigerants and refrigerant mixtures. ***W. A. Pennington.*** *Air Conditioning, Heating, and Ventilating*, v. 55, Nov. 1958, p. 71-86.

2282* Noise and Its Effect on Hearing. One of several papers from conference on noise control and conditioning. ***James H. Sterner.*** *American Industrial Hygiene Association Journal*, v. 19, no. 5, Oct. 1958, p. 387-388.

2283* Half Million Homes Now Heated. Statistics on the electric method of space conditioning. *Electric Heat and Air-conditioning*, v. 4, no. 6, Nov.-Dec. 1958, p. 13-17.

2284* The Heat Pump. A Summer-Winter Load Conditioner. Potential advantages as a summer-winter load conditioner and at the same time offering the customer an excellent method of year-round comfort conditioning. ***Karl K. Hickman.*** *Electric Light and Power*, v. 36, no. 23, Nov. 15, 1958, p. 66-69.

2285 Here Are New IES Lighting Recommendations. New and old recommendations are compared. An average hike of 150% in lighting levels is shown. *Engineering News-Record*, v. 161, no. 21, Nov. 20, 1958, p. 57 + 4 pages.

2286* An Improved Absorption Refrigeration Cycle. This new system, as compared to earlier absorption systems shows a 50% improvement in the coefficient of performance, a 30% reduction in fuel consumption, and a 25% reduction in cooling water requirements. ***E. P. Whitlow and J. S. Swearingen.*** *Gas Age*, v. 122, Oct. 30, 1958, p. 19-22.

2287 Quality Book Paper Manufacture Needs Quality Ventilation, Heating. Shows how well integrated industrial humidity control, heating, and ventilation systems can be designed to meet requirements. ***G. P. Patterson.*** *Heating, Piping & Air Conditioning*, v. 30, Nov. 1958, p. 105-107.

2288 HTHW System Tailor-Made to Meet Shopping Center's Design Limitations. Description of high-temperature, hot water heating system. ***Richard J. Bush.*** *Heating, Piping & Air Conditioning*, v. 30, Nov. 1958, p. 112-115.

2289 How to Select Right Air Conditioning System for Multi-Story Building. Shows how to equate performance against over-all cost as a guide to system selection. ***M. J. Wilson.*** *Heating, Piping, & Air Conditioning*, v. 30, Nov. 1958, p. 116-118.

2290* The Discomfort Index. It Measures Heat and Humidity. What it is and how it is computed. Widespread use would be particularly beneficial in areas of relatively mild temperature and high humidity. *Heating & Air Conditioning Contractor*, v. 50, no. 2, Nov. 1958, p. 48-51.

2291 Industrial Ventilation: How to Design for Heat Recovery. Compares installation costs for a built-up system and a system made up of several packaged units. ***John H. Clarke.*** *Heating, Piping & Air Conditioning*, v. 30, Nov. 1958, p. 123-128.

2292 Evaluation of Filters for Removing Irritants From Polluted Air. Two air-filter media were evaluated by their effectiveness in reducing human sensory irritation resulting from Los Angeles smog. ***N. A. Richardson and W. C. Middleton.*** *Heating, Piping & Air Conditioning*, v. 30, Nov. 1958, p. 147-154.

2293 Solar Radiant Gains Through Directional Glass Exposure. Reports tests conducted with an 8-ft. cubicle having one side constructed of glass. The cubicle was oriented in various directions with reference to the sun; the solar radiant gains caused changes in the air temperature in the cubicle. ***R. D. Cramer and L. W. Neubauer.*** *Heating, Piping & Air Conditioning*, v. 30, Nov. 1958, p. 155-162.

2294 Noise Abatement. Noise is damaging and creates extreme hazards in industry; noise abatement is a major project today. ***Walter G. Peck.*** *Paper Mill News*, v. 81, no. 5, Nov. 10, 1958, p. 10 + 1 page.

2295* Cooling Systems Based on Solar Regeneration. Evaluation of potentially useful binary absorption systems; how operating variables affect ideal thermal performance of refrigerant-absorbent systems; illustrative experimental data on solar operation of two intermittent refrigeration systems; analysis of experimental results of solar regeneration process as it affects refrigeration capacity. ***D. A. Williams, et al.*** *Refrigerating Engineering*, v. 66, Nov. 1958, p. 33 + 7 pages.

2296* How to Select and Specify Air Heating and Cooling Coils. A review of specification factors. ***Henry B. Williams.*** *Refrigerating Engineering*, v. 66, Nov. 1958, p. 38 + 6 pages.

2297* Mine Ventilation and Efficiency. Management is paying closer and more direct attention to ventilation practice and dust allaying, in promoting applied research in ventilation and allied problems, and by employing fully trained ventilation staff. ***B. J. R. Botha and J. A. Northcott.*** *South African Institute of Mining and Metallurgy, Journal*, v. 59, no. 3, Oct. 1958, p. 144-152.

2298 Filters Whip Fume Problem. Air conditioning system keeps welding area clear and recirculates decontaminated air in winter to cut heating bills. ***Steel,*** v. 143, Nov. 17, 1958, p. 126.

See also: **1189** (refrigeration); **1499** (cooling electronic equipment); **1629** (pulsations in gas-fired residential heating equipment).

TEXTILES, FIBERS, LEATHER, AND PAPER

2299* The Preparation, Isolation, and Growth in Culture of Single Cells From Higher Plants. Attempts to grow single cells on agar media, on filter paper over agar media, or in sealed hanging drops of "acclimated" medium generally were unsuccessful. Single cells grew successfully on filter paper over

established cultures. Most cultures of single cell origin (clones) grew well after transfer to agar, but some did not. Constant differences were observed among clones derived from the same parent stock of marigold (crown gall origin) in growth rate, texture, and color. Some clones with varied media have developed shoots or roots in culture. ***W. H. Muir, A. C. Hildebrandt, and A. J. Riker.*** *American Journal of Botany*, v. 45, no. 8, Oct. 1958, p. 589-597.

2300* An Apparatus for Maintaining Disks of Tissue in a Uniform Environment. Particular attention is paid to temperature control in the culture of disks of plant tissue. ***I. R. MacDonald and A. H. Knight.*** *Annals of Botany*, v. 22, no. 88, Oct. 1958, p. 423-427.

2301* Forest Fertilization in Europe. Its Research and Practices. ***Carl Olof Tamm.*** *Better Crops With Plant Food*, v. 42, no. 8, Oct. 1958, p. 6-15.

2302* A Look Ahead at Forest Fertilization Research—A New Silvicultural Tool. ***Earl L. Stone.*** *Better Crops With Plant Food*, v. 42, no. 8, Oct. 1958, p. 46-54.

2303 The Chemistry and Technology of Leather. v. II. Types of Tannages. ***Fred O'Flaherty, William T. Roddy, and Robert M. Lollar, editors.*** 554 pp. 1958. Reinhold Publishing Corporation, New York. (TS967 Of4c).

2304 Symposium on Wood as a Chemical Raw Material. Summary of Symposium. Wood wastes in the United States provide a potential source for a number of important chemicals, principally cellulose fibers, chemical cellulose and its derivatives, methyl alcohol, acetic acid, saccharinic acids, acetone, ethyl alcohol, charcoal, etc. ***Harry F. Lewis.*** *Journal of Chemical Education*, v. 35, Oct. 1958, p. 482-487.

2305* Composite Aerial Volume Table for Southern Pines and Hardwoods. Mixtures of loblolly-shortleaf pines and hardwoods cannot be effectively separated on 1:20,000 panchromatic photography for evaluating stand volume per acre. It is possible to construct aerial stand volume tables applicable to pine-hardwood mixtures. ***Gene Avery.*** *Journal of Forestry*, v. 56, Oct. 1958, p. 741-745.

2306* The Extraction of Large Wood Samples From Living Trees. Describes method in which a 2 by 1 inch sample from the bark to the pith was cut out using a modified bow saw. ***A. G. Brown.*** *Journal of Forestry*, v. 56, Oct. 1958, p. 764.

2307* Pectin & Wax Contents of Cotton & Their Relation to Its Physical Characters. The amount of pectin present per unit surface area of the fiber is practically the same for all the cotton varieties. A major portion of the pectic substances occurs on the surface of the fiber or is confined to the primary wall or cuticle. ***R. Narayan Rao, K. S. Bhujang, and C. Nanjundayya.*** *Journal of Scientific & Industrial Research*, v. 17B, Aug. 1958, p. 320-323.

2308 Terpene Formation in Pine From Mevalonic Acid. ***Robert G. Stanley.*** *Nature*, v. 182, Sept. 13, 1958, p. 738-739.

2309 A Novel Type of Metal-Protein Compounds. Outlines the reaction of neutral chromium complexes present in extremely basic chromium perchlorates with collagen. This reaction leads to the formation of an entirely new type of metal-protein complexes in which the uncharged chromium complexes are attached to the protein through its non-ionic keto-imide groups. Judging by the stabilization obtained by the fixation of these chromium perchlorate complexes, they cross-link the protein units. ***K. H. Gustavson.*** *Nature*, v. 182, Oct. 25, 1958, p. 1125-1128.

2310* Organizations and Co-operation in the Field of Pulp and Paper Research. A survey is given of the organized co-operation in the field of pulp and paper research. Scandinavian, European and international co-operation are dealt with separately. ***Waldmar Jensen.*** *Paperi ja Puu*, v. 40, no. 9, Sept. 1958, p. 425-430.

2311* On the Fiber Structure of Normal Birch Wood and Tension Wood by X-Ray Diffraction Technique. (*In Finnish.*) Koivun normaalipuun ja reaktiopuun kuiturakenteesta. ***Martti Kantola.*** *Paperi ja Puu*, v. 40, no. 9, Sept. 1958, p. 431 + 4 pages.

2312* β-Sitosterol From the Indigenous Tall Oil. A convenient method of isolating phytosterol, the raw material for the synthesis of steroid hormones, and the method of purifying β-sitosterol are described. (*In Polish.*) Beta-Sitosterol z krajowego oleju talowego. ***Eugenia Domagalina, Rufina S. Ludwiczak, and Irena Życzyńska.*** *Przemysl Chemiczny*, v. 37, no. 8, Aug. 1958, p. 540-542.

2313 Lignin. Reviews progress in the isolation and analysis of this important constituent of wood. ***F. F. Nord and Walter J. Schubert.*** *Scientific American*, v. 199, no. 4, Oct. 1958, p. 104 + 7 pages.

2314* Aspects on Tracheidal and Parenchymatous Ray Cells in Pulpwood Conifers. The Resin in Parenchymatous Cells and Resin Canals of Conifers. II. Anatomy of wood rays is reviewed, especially considering features and data of interest in pulp manufacture. Differences in dimensions of tracheidal and parenchymatous ray cells are discussed, as they are of importance for the purification of pulps by mechanical fractionation. ***Ernst Back.*** *Svensk Papperstidning*, v. 61, no. 17, Sept. 15, 1958, p. 523-530.

2315* The Polysaccharides of White Birch (Betula papyrifera). VII. Carbohydrates Associated With the Alpha-Cellulose Component. Exhaustive alkaline extraction of a holocellulose from white birch (*Betula papyrifera*, Marsh.) has yielded an alpha-cellulose which still contained galactose, mannose, arabinose, and xylose residues. Partial hydrolysis of the alpha-cellulose gave a series of disaccharides. Evidence was also obtained for the presence of another glucosyl mannose and a galactosyl mannose. Isolation of the glucosyl mannose constituted the first definite evidence for the existence of a chemical linkage between glucose and mannose residues in a deciduous wood. ***J. K. Gillham and T. E. Timell.*** *Svensk Papperstidning*, v. 61, no. 17, Sept. 15, 1958, p. 540-544.

2316* What Is Wood Cellulose—a Semantic Dilemma. ***Louis E. Wise.*** *Tappi*, v. 41, Sept. 1958, p. 14A + 4 pages.

2317* Nonwoven Fabrics in One Step. Details of a nonwoven fabric range which combines web forming, latex saturating, drying, curing, and winding into one unit. ***Howard D. McCall.*** *Textile Industries*, v. 122, Oct. 1958, p. 160-163.

2318 The Radial Distribution of Fibres in Blended Yarns. I. Characterization by a Migration Index. A migration index of ± 100% represents complete separation of the component in question from the other fibers, the positive and negative signs denoting outward and inward migration, respectively, while a migration index of zero may be taken to represent uniform distribution of the component throughout the yarn cross-section. ***J. B. Hamilton.*** *Textile Institute, Journal, Transactions*, v. 49, Sept. 1958, p. T411-T423.

2319 Behaviour of Wool Fibres in Electric Fields. Observations were made on the way in which long, fine wool fibers behave in electric fields to provide information on how fibers acquire charge, the distribution of charge, the forces acting on them and how they move in a field when free to do so. ***D. T. Liddy and J. G. Downes.*** *Textile Institute, Journal, Transactions*, v. 49, Oct. 1958, p. T467-T477.

2320* The Significance of Wool Fiber Crimp. II. A Study on the Woolen System. ***J. Menkart and Beatrice Joseph.*** *Textile Research Journal*, v. 28, Nov. 1958, p. 940-945.

2321* Attempts to Introduce Amide Cross-links Into Wool. Peptide-forming reagents have been applied to wool in an attempt to convert "salt links" into amide cross-links. Wool which has been modified with biscyclohexyl carbodiimide is almost unchanged in weight, handle, and appearance but has increased resistance to attack by alkali, alkaline thioglycollate, urea-bisulfite, and trypsin. The mechanism of the changes involved is not known. ***J. A. Maclaren.*** *Textile Research Journal*, v. 28, Nov. 1958, p. 946-948.

See also: **2218** (textile applications of acrylics); **2287** (ventilation and heating in papermills).

WELDING AND JOINING

2322 Wide-Gap Brazing Alloy Assembles Engine Rings. New brazing alloys join such difficult materials as high-temperature Ni-base alloys with high Ti and Al contents. ***R. C. Kellner.*** *American Machinist*, v. 102, Nov. 3, 1958, p. 98-99.

2323 Slope Control Makes Better Welds. Work is conditioned both before and after resistance-welding current is applied. Surface is prepared by increasing the heat gradually and the weld is annealed by slow cooling. ***John Kelly.*** *American Machinist*, v. 102, Nov. 3, 1958, p. 105-107.

2324 Metal Arc Welding of Aluminium Bronze Alloys. Some of the early difficulties encountered in welding these materials, mainly embrittlement. Properties of suitable electrodes and corresponding welding techniques. ***M. K. Williams and W. I. Pumphrey.*** *British Welding Journal*, v. 5, Oct. 1958, p. 445-449.

2325 Positioners for Automatic Welding of Atomic Reactor Housings. ***W. A. Davis.*** *British Welding Journal*, v. 5, Oct. 1958, p. 449-453.

2326 New Developments in Arc Welding Processes and Their Application. I. Developments in the Processes. New processes offer many advantages beside that of high metal deposition speeds. For highest economies it is essential to provide for maximum arc utilization by reducing handling, preparation, and setting-up time to a minimum. ***P. Shaw and D. B. Tait.*** *British Welding Journal*, v. 5, Oct. 1958, p. 454-464.

2327 Experiments With Self-Guiding Welding Equipment for Aluminium. Enables both butt and fillet joints to be made at high speed without elaborate jigging and with a minimum of attention. Automatic welding of simultaneously cambered and curved surfaces has been proved to be practical. ***J. E. Tomlinson and R. V. Blewett.*** *British Welding Journal*, v. 5, Oct. 1958, p. 465-471.

2328 Welding of Some Creep Resisting Steels. Development of alloy electrodes for three types of Cr-Mo steel, which provide satisfactory weld metal deposits. ***J. F. Mercer.*** *British Welding Journal*, v. 5, Oct. 1958, p. 472-474.

2329 Some Guidance on Welding Dissimilar Alloy Steels. Considers the problems of welding grades of low-alloy ferritic steels, stainless steels, and high-Ni alloys in different combinations, taking into account applications at room, sub-zero, and elevated temperatures. ***M. C. T. Bystram.*** *British Welding Journal*, v. 5, Oct. 1958, p. 475-480.

2330 Weldability of 3½% Ni-Cr-Mo Steel. Continuous cooling transformation diagrams covering normal weld cooling rates, produced for a 3½% Ni-Cr-Mo steel conforming to BS 970 En28, suggest that a small amount of residual H in a high-tensile steel is likely to have an adverse effect on its hard-zone crack resistance when the steel is welded without preheat. ***C. L. M. Cottrell and K. Winterton.*** *British Welding Journal*, v. 5, Oct. 1958, p. 481-484.

2331 Welded Joints and Residual Stresses. Describes the effects of residual stresses on arc-welded joints of various sizes. ***V. I. Trufyakov.*** *British Welding Journal*, v. 5, Nov. 1958, p. 491-498. (Translated from *Avtomaticheskaya Svarka*, 1956, no. 5, Oct.)

2332 Low Temperature Properties of Welded and Unwelded Al-5% Mg Alloy Plates. Mechanical tests were made on the Al-5% Mg alloy NP.5/6 at temperatures down to −196 C, to prove its suitability for the construction of storage tanks for liquefied gases. ***J. E. Tomlinson and D. R. Jackson.*** *British Welding Journal*, v. 5, Nov. 1958, p. 499-510.

2333 Tear Tests on Aluminium-Magnesium Alloy Plate. Tear tests were carried out on a Al-Mg alloy at room temperature and at −195 C, on plain and welded specimens. ***J. Sawkill and D. James.*** *British Welding Journal*, v. 5, Nov. 1958, p. 517-522.

2334* Welding Stainless Steels and H.T. Alloys. II. Describes the selection and welding techniques involved in the utliziation of high temperature alloys. ***H. A. Skelton.*** *Canadian Metalworking*, v. 21, Nov. 1958, p. 38 + 4 pages.

2335* Pipeline Welding Techniques. Latest procedures are described. ***P. Trippe.*** *Chemical & Process Engineering*, v. 39, Nov. 1958, p. 406-410.

2336* The Welding of Titanium. The argon-shielded-arc welding of Ti leads to welded joints whose properties are entirely satisfactory and usually meet operating requirements. (*In German.*) Schweissen von Titan. ***Klaus Rüdinger.*** *Chemie-Ingenieur-Technik*, v. 30, Oct. 1958, p. 633-635.

2337 Automatic Electrical Welding of Cathode Ray Tubes. *Engineering*, v. 186, Oct. 24, 1958, p. 554-555.

2338 Salvage of Iron Castings by Welding. Results obtained from arc-welding specimens from automobile castings in comparison with gas-welding at similar locations. ***José Carlos Pellegrino.*** *Foundry Trade Journal*, v. 105, Nov. 6, 1958, p. 573-574.

2339* Welding Procedures for Fabricating Aluminized Piping. A root pass alloyed with 3 to 10% Al is made by carefully controlling fusion of filler metal with the aluminized base metal. *Industry & Welding*, v. 31, Dec. 1958, p. 30 + 3 pages.

2340* Welding Aluminum Without Distortion. Some special procedures are presented for fabricating an Al automotive chassis. *Industry & Welding*, v. 31, Dec. 1958, p. 38 + 3 pages.

2341* Eleven Facts to Know About Ultrasonic Soldering. Applies to Al fabrications. ***Ralph Reynolds.*** *Industry & Welding*, v. 31, Dec. 1958, p. 45 + 1 page.

2342 High Strength Titanium Alloy Has Good Weldability. Good welds along with high strength may soon be the deciding factor in wider use of Ti. New Ti-3Mo-0.25Be alloy gets its high strength in age or dispersion hardening. ***F. A. Crossley.*** *Iron Age*, v. 182, no. 18, Oct. 30, 1958, p. 84-86.

2343 Die-Cut Adhesive Film Bonds Iron to Aluminum. Premixed film adhesives insure bonds of uniform thickness without mess or waste. *Iron Age*, v. 182, no. 18, Oct. 30, 1958, p. 88-89.

2344 Are Missile Fastener Specs Being Set Too High? Fasteners can create costly bottlenecks in crash missile programs. Stock fasteners can mean big savings in time and money. ***H. G. Brilmyer.*** *Iron Age*, v. 182, no. 18, Oct. 30, 1958, p. 93-95.

2345 One Drop of Adhesive Binds Heavy Metals. Some properties of Eastman's new 910 Adhesive. *Iron Age*, v. 182, no. 20, Nov. 13, 1958, p. 101.

2346 Submerged Arc Welding Helps Steel Plant Maintenance. Gives examples to demonstrate efficiency. ***James Angus.*** *Iron and Steel Engineer*, v. 35, Nov. 1958, p. 132 + 2 pages.

2347* Synthetic Resin Adhesives: A Survey. Present day adhesives are divided into groups according to properties. (*In German.*) Zur Systematik der synthetischen Klebstoffe. ***Rudolf Köhler.*** *Kunststoffe*, v. 48, Oct. 1958, p. 441-444.

2348* Metallic Bonds. I. Influence of Various Factors on Bond Strength. Various external influences are considered in connection with bond strength. (*In German.*) Die Metallklebverbindung. II. Einfluss verschiedener Faktoren auf die Festigkeit. ***Heinz Peukert.*** *Kunststoffe*, v. 48, Oct. 1958, p. 453-458.

2349* Tannin-Formaldehyde Adhesives. Adhesives are made from tannin extracted from the bark of tropical and sub-tropical trees. Their composition, properties, and methods of application are discussed. (*In German.*) Tannin-Formaldehyde-Kleber. ***D. Narayanamurti and N. R. Das.*** *Kunststoffe*, v. 48, Oct. 1958, p. 459-462.

2350* Types of Electrodes Used for H.F. Welding PVC Sheeting. The Guillotine Edge. The final appearance of an H. F. welded seam in PVC sheeting is governed by the nature of the lower edge of the electrode. Various types of electrode are described. (*In German.*) Elektrodenformen beim HF-Schweissen von Weich-PVC-Folien. Die Abschneide-Kante.

Kurt Brandenburger. *Kunststoffe*, v. 48, Oct. 1958, p. 491 + 1 page.

2351 Selecting Solders for Low Temperature Service. Types that seem best for use with liquefied gases, based on tensile and impact data. ***A. B. Kaufman.*** *Materials in Design Engineering*, v. 48, Nov. 1958, p. 114-115.

2352 Edge-Welding Small Containers. Gas-tight seals can be readily made in small containers to protect pressure-sensitive or temperature-sensitive electrical and electronic assemblies. Tungsten arc, protected by argon gas, makes edge welds between walls and bases in simple semi-automatic devices. ***D. W. Grobecker.*** *Metal Progress*, v. 74, no. 5, Nov. 1958, p. 104-107.

2353 Heat Program Timer Improves Resistance Welds. Resistance welding calls for precision control of time and magnitude of current. A unit known as a "heat program timer" causes the secondary welding current to increase gradually so that the joint interface is effectively conditioned before peak current is reached. ***Burton B. Stuart.*** *Metal Progress*, v. 74, no. 5, Nov. 1958, p. 109-110.

2354 What's New in Production Riveting Practice. Equipment and procedures. Included are cost comparisons and much other valuable information. ***R. M. Gordon.*** *Metalworking*, v. 14, Nov. 1958, p. 3-5.

2355* Welded Bellows, Important Advance in Bellows Application. Description, properties, and application of welded metal bellows. ***Michael M. Grore.*** *Missile Design and Development*, v. 4, Nov. 1958, p. 17 + 1 page.

2356 Enclosed Welding of Rail Sections. . . . consists in enclosing the vertical gap between the two sections that are to be welded together in an enclosure made up of copper blocks. The welding has to be done with extra low-hydrogen electrodes. *Philips Technical Review*, v. 20, no. 4, Oct. 1958, p. 94-100.

2357* Symposium on Metal Bonding. Adhesives; cutting tips bonded by Epoxy 1001 for high speed cutting tools; effect of surface pretreatment on bonding strength. (*In German.*) Zur Fachtagung Metallklebetechnik. *Plaste und Kautschuk*, v. 5, Sept. 1958, p. 323-344.

2358* Submerged Arc Welding. Principles and theory of the flow of electric current through the flux; description of automatic welding heads, current sources, wires, and fluxes. Use of parallel or twin-electrodes for welding, and of serial electrodes for reloading. (*In French.*) Le soudage a l'arc submergé. ***L. Adam.*** *Revue Universelle des Mines*, v. 14, ser. 9, Oct. 1958, p. 317-328.

2359* Gas Shielded Electric Arc Welding. Application of A arc welding with a W electrode to the end-to-end joining of pipes made of stainless, alloyed, or carbon steel. For very thick material, consumable electrode A arc welding is best and is used for the welding of light alloys, couprous metals, and carbon steel. Carbonic dioxide shielded arc welding, although very economical, is more limited in its application. (*In French.*) Soudage a l'arc électrique sous protection gazeuse. ***A. Moreau.*** *Revue Universelle des Mines*, v. 14, ser. 9, Oct. 1958, p. 329-342.

2360* Practical Application of the Iron-Carbon Diagram in Welding Technique. Effect of temperature and time, aging, isothermal transformation and recrystallization. In a special case of fusion welding, the effects of heating and cooling on the structures formed were studied with the help of various steel microsections. (*In German.*) Zur Nutzanwendung des Eisen-Kohlenstoff-Diagramms in der Schweisstechnik. ***Friedrich-Carl Althof and Gerhard Hoffmann.*** *Schweisstechnik*, v. 12, Aug. 1958, p. 105-112.

2361* Coated Electrode Arc Welding With Deep Penetration. Results of Investigations Conducted at the Welding Institute. IV. Pt. 2. Results: Effects of the Electrical Characteristics on Penetration and Its Regularity. Studies of the Compactness and Mechanical Characteristics of the Seams. (*In French.*) Soudage à l'arc avec électrodes enrobées à forte pénétration. Résultats d'études faites a l'institut de soudure. IV. (2 parties) Resultats: Influence des caractéristiques électriques sur la pénétration et sa régularité. Etudes relatives à la compacité et aux caractéristiques mécaniques des joints. ***A. Gaubert.*** *Soudage et Techniques Connexes*, v. 12, nos. 7/8, July-Aug. 1958, p. 249-262.

2362* A Welding Process Applicable to the Fabrication of Steel Pressure Vessels for Atomic Energy Purposes: Argon Arc Welding With a Consumable Electrode. Argon arc welding gives the weld metal good impact values in nuclear reactor vessel structures which may be as thick as 150 mm, and costs are only slightly higher than in the case of submerged arc welding. (*In French.*) Un procédé de soudage applicable à la fabrication de capacités sous pression en acier, destinées à l'énergie atomique. Le soudage en atmosphère d'argon avec électrode fusible. ***J. Tigeot.*** *Soudage et Techniques Connexes*, v. 12, nos. 9/10, Sept.-Oct. 1958, p. 325-335.

2363* Determination of the Total Hydrogen Contents of the Weld Metal. Recommendations are developed in view of the determination of the total hydrogen contents of one-pass welded beads. Describes the test piece, sampling, and measuring methods. (*In French.*) Détermination de la teneur totale en hydrogène du métal déposé. *Soudage et Techniques Connexes*, v. 12, nos. 9/10, Sept.-Oct. 1958, p. 335-338.

2364* Co-operative Investigation of the Reproducibility of the Controlled Thermal Severity Weldability Test for Low Alloy Steels. Consists essentially of the deposition of a fillet weld under predetermined conditions and of the subsequent examination of transverse sections of the weld for cracks in the heat-affected zone of the parent plate. (*In French.*) Recherche en coopération sur la fidélité de l'essai de sévérité thermique contrôlée pour l'étude de la soudabilité des aciers faiblement alliés. *Soudage et Techniques Connexes*, v. 12, nos. 9/10, Sept.-Oct. 1958, p. 345-353.

2365* A Comparison of Methods of Assessing Spot Weld Ductility in Sheet Steels. Tests were carried out on spot welds made in different welding conditions on four steels containing 0.04 to 0.20% C, in the 1.2 and 2 mm. thickness range. Relations found can be used as new bases for assessing spot weld ductility. (*In French.*) Comparaison des methodes de contrôle de la ductilité d'un point de soudure sur tôle d'acier. ***E. J. French and A. A. Wells.*** *Soudage et Techniques Connexes*, v. 12, nos. 9/10, Sept.-Oct. 1958, p. 369-392.

2366 CO_2 Welder Makes Casting Repair Easier. Gas shielding eliminates slag removal, speeds rate of metal deposit, and cuts labor costs. ***J. J. Chyle.*** *Steel*, v. 143, Nov. 17, 1958, p. 110-112.

2367 The Tinning of Wire for Soldering. *Tin and Its Uses*, 1958, no. 44, Autumn, p. 13-14.

2368 Electron Beam Vacuum Welding—Development of Process. The process consists of focusing a beam of high velocity electrons which act as a heat source. The equipment required includes a vacuum chamber, an electron gun, and a high voltage power supply. In operation the electrons are accelerated and focused onto the work pieces by a high voltage potential between the work pieces and the gun. ***W. L. Wyman and W. I. Steinkamp.*** *U. S. Atomic Energy Commission, HW-55667*, Apr. 8, 1958, 45 pp. (UF767 Un3.1hw Contin.)

2369 Fundamentals of Diffusional Bonding. III. Investigates interdiffusion in the Al-U system and of the effects thereon of applied pressure. In confirmation of the results of other studies, it has been found that UAl_3 layer growth is accelerated by increasing applied pressure. ***L. S. Castleman and L. Seigle.*** *U. S. Atomic Energy Commission, SEP-251*, June 30, 1958, 28 pp. (UF767 Un3.1se Contin.)

2370 Preliminary Investigation of Properties of High-Temperature Brazed Joints Processed in Vacuum or in Molten Salt. An investigation was conducted to determine the shear strengths of high-temperature-alloy brazed joints. The variables investigated were the method of brazing, brazing temperature, holding time at temperature, and a protective coating on the braze area for salt-bath specimens. ***C. A. Gyorgak and A. C. Francisco.*** *U .S. National Advisory Committee for Aeronautics, Technical Note* 3450, May 1955, 29 pp. (TL570 Un3t Vis.)

2371 Final Report to the Ship Structure Committee on Weld Flaw Evaluation. Emphasizes the important bearing that residual stress has on the brittle fracture problem and the need for extended investigations in brittle fracture mechanics based on strain-energy release rates to furnish a complete engineering basis for flaw evaluation. ***Samuel T. Carpenter and Roy F. Linsenmeyer.*** *U. S. Ship Structure Committee, SSC-* 105, July 29, 1958, 117 pp. (VM1 Un3.7s Contin.)

2372* Brazing in Vacuum. Machined parts or whole systems of magnetrons, klystrons, or X-ray tubes are mounted in vacuum chambers made of metal or quartz, and while heated by induction the components are predegassed and then brazed or hard soldered. (*In German.*) Das Löten im Vakuum. ***F. Bernhard and H. Bumm.*** *Vakuum-Technik*, v. 7, no. 7, Oct. 1958, p. 153-158.

2373 Zirconium. Welding procedures and weld properties. ***F. G. Cox.*** *Welding and Metal Fabrication*, v. 26, Oct. 1958, p. 358-365.

2374 Vacuum Welding of Metals. Lists advantages of vacuum welding when atmosphere must be excluded. ***J. A. Stohr and J. Briola.*** *Welding and Metal Fabrication*, v. 26, Oct. 1958, p. 366-370.

2375 Practical Aspects of Automatic Welding. I.-II. Basic requirements of joint design, edge preparation, fit-up and joint cleanliness are specified and the effects of the main welding variables, namely, welding current, arc voltage, and speed of welding, are outlined. ***J. A. Lucey.*** *Welding and Metal Fabrication*, v. 26, Oct. 1958, p. 375-380; Nov. 1958, p. 397-402.

2376 Tooling and Welding Team-Up for Economy—on Specialized Pressure Vessels. Aircraft and missile manufacturers make good use of tooling and welding to gain required quality for pressure vessels, plus a cost-savings. ***Gerald Garfield.*** *Welding Engineer*, v. 43, Dec. 1958, p. 40-42.

2377 Contour Welding With a Magnetic-Tape Tracer System. Through automation untrimmed, out-of-tolerance, straight or contour parts can be accurately joined. *Welding Engineer*, v. 43, Dec. 1958, p. 50-51.

2378 Resistance Welds Will Improve If You Know Your Metals and Electrodes. II. Electrode material standards—plus tips on weldability of various metals. ***Lester F. Spencer.*** *Welding Engineer*, v. 43, Dec. 1958, p. 54 + 3 pages.

2379 An Investigation of Lap Seam Welds in 17-7 PH Stainless Steel. Development and calibration of instrumentation for measurement of welding current are described. Also, data on the seam welding of 17-7 PH stainless steel to be used in the TH-1050 condition are presented. ***E. J. Funk and A. C. Willis.*** *Welding Journal*, v. 37, Sept. 1958, p. 897-905.

2380 Comparisons Between Welds in Iodide- and Sponge-Base Titanium Alloys. Describes the preparation of 18 experimental alloys and the results from base-metal, weld-metal, and weld-joint studies. ***W. J. Lewis, M. L. Kohn, and G. E. Faulkner.*** *Welding Journal*, v. 37, Sept. 1958, p. 385s-390s.

2381 Control of Melting Rate and Metal Transfer in Gas-Shielded Metal-Arc Welding. II. Control of Metal Transfer. Axial-spray transfer is preferred to globular transfer or to rotating-spray transfer to assure maximum arc stability and minimum spatter. ***A. Lesnewich.*** *Welding Journal*, v. 37, Sept. 1958, p. 418s-425s.

2382 Welding Alloy Steels Under Bonded Fluxes. Use of bonded submerged-arc fluxes in pipe welding, in preparing overlays or clad surfaces, and in welding high-strength low-alloy steels. ***Hallock C. Campbell and Wallace C. Johnson.*** *Welding Journal*, v. 37, Nov. 1958, p. 1081-1085.

2383 Some Considerations Regarding Consumable-Electrode Inert-Gas-Welding Filler Wire. In order to remedy the erratic burn-off behavior sometimes encountered, it is proposed that the electrode wire be coiled to a specified diameter set or cast for more intimate contact at discharge end of contact tube. ***L. M. Petryck.*** *Welding Journal*, v. 37, Nov. 1958, p. 1086-1089.

2384 Welding Products Play Important Roles in Development and Production of Transistors. ***Robert Ingraham and J. F. Buerkell, III.*** *Welding Journal*, v. 37, Nov. 1958, p. 1097-1098.

2385 Effects of Chemical Composition on Cracking Resistance of High-Strength-Steel Weld Metals. A study was made to determine the effects of carbon, sulfur, phosphorus, and rare-earth metal on the cracking resistance of high-strength steel weld metals. Experimental equipment was designed and built to determine the strength and ductility properties of the high-strength steel under conditions that simulate the cooling of a weld deposit. The properties were obtained during rapid cooling from the liquid state. The results show that phosphorus, although within the specification limits of aircraft-quality steels, is responsible for low ductility and cracking of welds at temperatures near the solidus. ***R. P. Sopher.*** *Welding Journal*, v. 37, Nov. 1958, p. 481s-492s.

2386 Metallurgy of Bonding in Brazed Joints. I. Base Metal-Filler Metal Interaction, Excluding Compound Formation. The dissolving of the base metal in the molten filler metal and the structure of the solidified filler metal are among the metallurgical considerations discussed. ***Nikolajs Bredzs and Harry Schwartzbart.*** *Welding Journal*, v. 37, Nov. 1958, p. 493s-498s.

2387 Development of Methods for End Capping PWR Fuel Elements. Satisfactory bonds are produced using a medium-capacity spot-welding machine for resistance-upset welding under vacuum, but corrosion behavior of joints is not consistently acceptable. ***Julius J. Vagi and David C. Martin.*** *Welding Journal*, v. 37, Nov. 1958, p. 499s-506s.

2388 Mechanical Tests of Spot Welds. Interprets and discusses a number of destructive mechanical tests normally employed to evaluate spot-welded joints. ***E. C. Hartmann.*** *Welding Journal*, v. 37, Nov. 1958, p. 520s-523s.

2389* Sound Welds Reported for Resistance Welded Low Carbon Steel Pipe in Evaluation Tests. Tests were conducted in accordance with American Petroleum Institute specification to determine ability of welded pipe produced by this process to satisfy all phases of the API code. *Western Metalworking*, v. 16, Oct. 1958, p. 48-50.

2390* New Tooling Concept for Welding Missile Pressure Vessels. Presents a step-by-step procedure. ***Gerald Garfield.*** *Western Metalworking*, v. 16, Nov. 1958, p. 58-60.

2391 Electrical Resistance Welding. Welding operations related to wire drawing operations. ***D. S. Faulkner.*** *Wire and Wire Products*, v. 33, Sept. 1958, p. 989 + 5 pages.

See also: **1283** (ceramic-metal bonding adhesives); **1867** (heat treatment of welds); **1997** (distribution of C in 18-8 steel); **1998** (alpha phase in austenitic welds); **2031** (inspection of light-alloy welds).

MISCELLANEOUS

2392 Maintenance of Alertness by a Loud Auditory Signal. When the failure to detect a target was coupled with the occurrence of the blast of a truck horn, average visual target detection percentages increased substantially, especially for the less proficient observers. ***Irwin Pollack and P. Robert Knaff.*** *Acoustical Society of America, Journal*, v. 30, Nov. 1958, p. 1013-1016.

2393* Handling Fertilizer Liquids With Safety. Use of goggles, tank car practice, and safety equipment. ***Larry Lortscher.*** *Agricultural Chemicals*, v. 13, Nov. 1958, p. 30 + 4 pages.

2394* Mixed Problems for Partial Differential Equations With Two Independent Variables. Study of an equation with constant coefficients, two independent variables and an unknown function satisfying the Petrov condition of uniform

correctness of the problem of Cauchy. (*In Russian.*) O smeshannykh zadachakh dlia uravenii v chastnykh proizvodnykh s dvumia nezavisimymi peremennymi. ***S. L. Sobolev.*** *Akademiia Nauk SSSR, Doklady*, v. 122, no. 4, Oct. 1, 1958, p. 555-558.

2395 Need Ideas? Nurture a Creative Atmosphere. Lists six management musts for a successful creativity program. ***B. B. Goldner.*** *American Business*, v. 28, Nov. 1958, p. 11-14.

2396* Toxicity of 1,1,1-Trichloroethane as Determined on Laboratory Animals and Human Subjects. Both the above and its inhibited form, chlorothene, have desirable safety qualities as solvents. ***T. R. Torkelson, F. Oyen, D. D. McCollister, and V. K. Rowe.*** *American Industrial Hygiene Association Journal*, v. 19, no. 5, Oct. 1958, p. 353-362.

2397* Transformations of Integrals. Presents a completely analytical treatment of the theory of "change of variable" in multiple integrals. ***Iain T. Adamson.*** *American Mathematical Monthly*, v. 65, no. 8, Oct. 1958, p. 590-596.

2398* Introduction to Arithmetic Factorization and Congruences From the Standpoint of Abstract Algebra. ***H. S. Vandiver and Milo W. Weaver.*** *American Mathematical Monthly*, v. 65, no. 8, pt. 2, Oct. 1958, 53 pp.

2399* A Survey of the Theory of Spectral Operators. Properties of spectral operators, their multiplicity theory, theory of algebras, and the problem of determining conditions on an operator sufficient to make it a spectral operator. ***Nelson Dunford.*** *American Mathematical Society, Bulletin*, v. 64, no. 5, Sept. 1958, p. 217-274.

2400* Students, Groups, and Teaching Methods. Effects of different teaching techniques and variables are evaluated. ***Wilbert J. McKeachie.*** *American Psychologist*, v. 13, Oct. 1958, p. 580-584.

2401* Finding Sites for Elevated Tanks. Summarizes engineering, economic, and public relations considerations in selection of a site for a proposed elevated water storage tank. ***Clyde E. Williams.*** *American Water Works Association, Journal*, v. 50, Nov. 1958, p. 1433-1437.

2402* On the Inversion Complexity of a System of Functions. Consideration of the inversion complexity of a system of functions excluding Boolean functions. ***A .A. Markov.*** *Association for Computing Machinery, Journal*, v. 5, no. 4, Oct. 1958, p. 331-334. (Translated by *Morris D. Friedman* from *Akademiia Nauk SSSR, Doklady*, v. 116, 1957, p. 917-919.)

2403* On the Solution of Poisson's Difference Equation. An illustration of a general method for estimating the difference between corresponding solutions of differential and difference equations based on Green's function. ***Pentti Laasonen.*** *Association for Computing Machinery, Journal*, v. 5, no. 4, Oct. 1958, p. 370-382.

2404* Peace for the Atom. An impression of the Geneva Conference. *Atomics & Nuclear Energy*, v. 9, Oct. 1958, p. 332 + 3 pages.

2405* Plant Design and Occupational Health. Potential causes of occupational injury and illness of chemical workers are discussed and a provisional specification for safe employment is provided in the form of check lists. ***E. F. Edson.*** *British Chemical Engineering*, v. 3, Nov. 1958, p. 608-612.

2406 Liberal Education in a Scientific Age. Science, in ever greater measure, must permeate the study and teaching of the arts, humanities, and social studies. These, on their side, must mollify, enrich, and protect the sciences. ***Bentley Glass.*** *Bulletin of the Atomic Scientists*, v. 14, no. 9, Nov. 1958, p. 346-353.

2407* The Statistical Distribution of the Curvature of a Random Gaussian Surface. The distribution of the total (or "second") curvature is derived on the assumption that the squares of the surface slopes are negligible. The distribution is found to depend on only two parameters, derivable from the fourth moments of the energy spectrum of the surface. ***M. S. Longuet-Higgins.*** *Cambridge Philosophical Society, Proceedings*, v. 54, pt. 4, Oct. 1958, p. 439-453.

2408* The Clock Paradox. The paradox depends on the theory of relativity and the strange phenomena that result when a body travels at a velocity near the velocity of light. An experimental verification one way or the other may be imminent. ***W. F. Campbell.*** *Canadian Aeronautical Journal*, v. 4, no. 9, Nov. 1958, p. 316-319.

2409* Future Automatic Plant: 5 Requirements. Examples of automatic assembly point to future economies. *Canadian Metalworking*, v. 21, Oct. 1958, p. 28 + 2 pages.

2410 6 Steps to Truly Creative Research. Our need for true scientific creativity is greater today than at any other time in our history. How do we best achieve it; how can chemical management create an environment to foster the best in scientific thinking? ***W. George Parks.*** *Chemical Processing*, v. 21, Oct. 1958, p. 39 + 2 pages.

2411 Creative Thinking. Examines current thinking about creativity in an objective manner and provides management with advice on the subject of creative training and its benefits. Describes operational techniques of creative thinking, including group discussion methods such as brainstorming and analytical or mechanical techniques that various persons or groups have found useful. ***Charles S. Whiting.*** 168 pp. 1958. Reinhold, New York. (BE408 W58c)

2412* Scientific Training and Technology. Typical of several papers in this journal is this one describing the search for more and better technicians in Europe based on education and vocational training. ***F. H. Raymond.*** *EPA Bulletin*, no. 30, Sept.-Oct. 1958, p. 7-9.

2413 A Scientific Tour Through the Soviet Union. Report of a 3½-week tour during which five important solid-state research laboratories were visited. ***W. C. Dunlap.*** *Electrical Engineering*, v. 77, Nov. 1958, p. 1027-1031.

2414* Safety Practices Go Modern. Developments and techniques used in the electrical industry. *Electrical World*, v. 150, Oct. 20, 1958, p. 98.

2415* The Montreal Power Conference. II. A review of those technical sessions at which the subjects of coal, oil and gaseous fuels, and nuclear energy and nuclear fuels, were discussed. The theme was "economic trends in the production, transportation and utilization of fuel and energy". *Engineer*, v. 206, Oct. 3, 1958, p. 520-523.

2416 Training to Understand People. Discusses different interpretations that are put on the word "understanding" and the confusion that can arise when they are not recognized. ***Z. M. T. Tarkowski.*** *Engineering*, v. 186, Sept. 19, 1958, p. 377-378.

2417 Road Accidents. Although present investigations are producing valuable information on injuries in relation to vehicle design, they lack the quantitative information that is necessary for the detailed design of protective measures. ***H. J. H. Starks.*** *Engineering*, v. 186, Oct. 10, 1958, p. 466-469.

2418 Standard of California. Standard hit the jackpot in the Middle East, which now furnishes one-third of its profits. Its far-flung operations bring to focus the trials and triumphs of the U. S. oil industry. ***Spencer Klaw.*** *Fortune*, v. 58, no. 5, Nov. 1958, p. 113 + 8 pages.

2419* The Soviet Challenge and Our Scientific Response. U. S. citizens must realize that intellectual achievement is just as important to survival as material prosperity. To maintain the military strength needed to deter aggression, we must plan our scientific effort more consciously, mobilize and cultivate all our talents. ***James R. Killian, Jr.*** *General Electric Defense Quarterly*, v. 1, no. 3, Oct.-Dec. 1958, p. 4-7.

2420* NASA Charter: No Wasted Effort—No Wasted Time. Answers to questions on how America's new civilian aeronautical and space agency will spend $301,500,000 for Research and Development. ***Hugh L. Dryden.*** *General Electric Defense Quarterly*, v. 1, no. 3, Oct.-Dec. 1958, p. 15-18.

2421 What Good Is an Accident? A thorough investigation and well-written report is of value only to the extent that recommended corrective action is publicized and put into effect

where applicable. ***S. M. MacCutcheon.*** *Industrial and Engineering Chemistry*, v. 50, Nov. 1958, p. 77A-78A.

2422* A Basic Guide to Legal Problems in New Products. The independent consulting firm, the potential competitor, selected outside groups of people, and the completely unsolicited outsider are often sources of new product ideas. Covers patents, licenses, trademarks, and copyrights. ***John W. Bohlen.*** *Industrial Marketing*, v. 43, Nov. 1958, p. 69-73.

2423* Thinking Ahead in Engineering Education. The Place of the Engineering Technician. Concludes that we are rapidly approaching the time when our technological manpower team will be composed of something like 10 engineering technicians and 150 skilled mechanics for each engineer or scientist. ***G. Ross Henninger.*** *Journal of Engineering Education*, v. 49, no. 2, Nov. 1958, p. 108-117.

2424* Some Economic Aspects of the Cold War. The present Soviet economic threat and its probable course in the near future. ***Neil H. Jacoby.*** *Journal of Industrial Engineering*, v. 9, no. 5, Sept.-Oct. 1958, p. 387-390.

2425* The Influence of a Distorted Group Norm Upon Individual Judgment. Indicates that there exists a continuum of susceptibility to group influence rather than a simple yielding-independence typology. Individual differences were remarkably large. ***Read D. Tuddenham.*** *Journal of Psychology*, v. 46, Oct. 1958, p. 227-241.

2426* Electro-Chemical Stabilization of Ground Under Foundation. Passage of currents from electrodes into clay soils results in ionic flow of metal salts which hardens and strengthens the ground. ***Shin-ichiro Matsuo.*** *Kyoto University, Memoirs of the Faculty of Engineering*, v. 20, pt. 3, July 1958, p. 149-162.

2427 A Generalized Matrix Algebra. Deals with a generalized system where all matrices have at least one multiplicative inverse. The different inverses as well as reciprocals of an arbitrary matrix are given and there is also a study of the corresponding (singular) unit matrices. Finally there is an application for non-independent statistical variables. ***Arne Bjerhammar.*** *Kungliga Tekniska Högskolans Handlingar*, no. 124, 1958, 32 pp. (T4 K96t Vis.)

2428* Psychological Aspects of Laboratory Work. II. A Psychological Approach to Problems of Measurement. ***Roland Harper.*** *Laboratory Practice*, v. 7, Nov. 1958, p. 648-651.

2429 Safety Arrangements for Pressure Die Casting Machines. Sixteen schemes are illustrated. *Machinery (London)*, v. 93, Oct. 29, 1958, p. 1003-1016.

2430 Aspects of Russian Engineering Industry. Studies of the Z. I. Likhachjov Automobile Works, in Moscow, and the Leningrad Steel Rolling Plant. The Moscow works are engaged in the production of Z.I.L. motor lorries and omnibuses in large quantities, also small numbers of motor cars. *Machinery (London)*, v. 93, Nov. 12, 1958, p. 1096-1110.

2431 How Safe Are Your Company Secrets? Summarizes protective measures of some companies. ***Alfred G. Larke.*** *Management Review*, v. 47, Nov. 1958, p. 40-42.

2432* Reciprocal Problem for Differential Operators of $n > 2$ Order With Analytic Coefficients. Derivation of a very simple formula which can be used in solution of the problem. (*In Russian.*) Obratnaia zadacha dlia differentsial'nykh operatorov poriadka $n > 2$ s analiticheskimi koeffitsientami. ***L. A. Sakhnovich.*** *Matematicheskii Sbornik*, v. 46, no. 1, Sept. 1958, p. 61-76.

2433* You Can Sharpen Your Thinking. Ways to avoid fallacies in making decisions. ***Charles A. Cerami.*** *Nation's Business*, v. 46, ov. 1958, p. 34 + 3 pages.

2434* Imagination in Science. Claims the current utilitarian conception of the mind must be broadened to take fuller account of its imaginative powers. ***John Cohen.*** *New Scientist*, v. 4, Oct. 9, 1958, p. 996-997.

2435 Security With Solvency. National security can be achieved selectively acquiring only those military capabilities best calculated to support a plan of national defense based on conventional forces backed by retaliatory atomic potential. ***Richard H. Bowers.*** *Ordnance*, v. 43, Nov.-Dec. 1958, p. 408-410.

2436 How to Accomplish More With Less Work. Successful executives use the formula: "refer, defer, delete". ***Jack E. Bedford.*** *Petroleum Engineer*, v. 30, Nov. 1958, p. A33-A34.

2437 Prepare Yourself for Inventing. III. How to Invent. Even though most inventions come from the workings of the subconscious mind, here are some fundamentals which will improve your ability to invent. ***Forrest E. Gilmore.*** *Petroleum Refiner*, v. 37, Oct. 1958, p. 196 + 3 pages.

2438* Oil Companies Willing to Spend to Make Money With Research. Briefly reviews a series of petroleum research activities. *Petroleum Week*, v. 7, no. 20, Nov. 14, 1958, p. 58 + 16 pages.

2439 The Phillips Pavilion at the 1958 Brussels World Fair. II. The Hyperbolic-Paraboloidal Shell and Its Mechanical Properties. The geometry of the hypar shell; the membrane theory of the hypar shell; edge disturbances; stability against buckling and second order buckling. ***C. G. J. Vreedenburgh,*** *Philips Technical Review*, v. 20, no. 1, Sept. 1958, p. 9-17.

2440 Next Redesign Project? Engineering Curricula. Claims graduates are coming from engineering schools that teach the way they did 50 years ago. He urges a fresh look, and offers a 3-part program for improvement. ***Eric A. Walker.*** *Product Engineering*, v. 29, no. 47, Nov. 17, 1958, p. 35-36.

2441* Determination of Stability by Linear Approximation of a Periodic Solution of a System of Differential Equations With Discontinuous Right-Hand Sides. *M. A. Aizerman and F. R. Gantmacher.* *Quarterly Journal of Mechanics and Applied Mathematics*, v. 11, pt. 4, Nov. 1958, p. 385-398.

2442 The Test of Simplicity. Explication of the standards of simplicity constitutes one of the most pressing current problems in the philosophy of science. ***Nelson Goodman.*** *Science*, v. 128, Oct. 31, 1958, p. 1064-1069.

2443 Science Teaching Improvement Program. Changes in interest in science education point to gains, if regional effort can be increased. ***John R. Mayor.*** *Science*, v. 128, Nov. 21, 1958, p. 1262-1265.

2444 What Are the Safety Hazards of Nuclear Propulsion? The designers of airborne nuclear engines must beat safety hazards such as we've never come up against before. This article, the first in a two-part series, goes into the problems of crash protection, overheating, and heat production after shutdown. Next month's article will give details on biological shielding and xenon poisoning. ***Leo Seren.*** *Space/Aeronautics*, v. 30, no. 5, Nov. 1958, p. 18-19.

2445 Soviet Technical Progress. A discussion of Russian advances in space technology. ***Ronald C. Wakeford.*** *Space Journal*, v. 1, no. 4, Fall 1958, p. 4-11.

2446 The Educational Challenge. The Russian challenge suggests that our great, free universities have no peers, but around them lies an immense zone of uncertainty. We can only hope that the many weaknesses inherent in our schools will be discovered, analyzed and corrected. ***Frederick I. Ordway, III.*** *Space Journal*, v. 1, no. 4, Fall 1958, p. 12-27.

2447* An Introduction to Statistical Methods. Presents a brief outline of statistics which should prove useful to the engineer. Emphasis is on statistical methods rather than the mathematical theory of statistics. ***Charles S. Inden.*** *Sperry Engineering Review*, v. 11, no. 3, Oct. 1958, p. 28-33.

2448* U. S. Progress in Science and Education. Whatever our major national goals may be, the first essential is to achieve better education, better science, better technology. This requires improvement of quality in education and performance. ***Alan T. Waterman.*** *Technology Review*, v. 61, no. 1, Nov. 1958, p. 33 + 4 pages.